Data Sheet

EM-MPO/.., ENC2/S

Multi-Parameter Electricity Meters and Node Controller

EM-MPO/.., ENC2/S Multi-Parameter Electricity Meters and Node Controller

Description

EM/MPO/..

The EM-MPO/... is a range of 3 phase, multi-parameter electricity meters. The /STAR3 is a through panel mounted unit with a high visibility red on black LCD digital display. The /STAR3DIN is a DIN rail mounted unit with a dot matrix LCD display. The /SIRIO is a DIN rail mounted economy version with a 128 segment (8 digit) LCD display. All three units require 5 A current transformers. Voltage transformers may be used on /STAR3 and /STAR3DIN for medium voltage measurements. The required transformer ratios are programmable from the panel. An RS485 connector cable links the EM-MPO/... to the ENC2/S's RS485/RS232 converter. Used in conjunction with the network interface (ENC2/S, Electricity Meter Node Controller) all logged data can be accessed directly over the IQ system network. Ideal for applications where analysis of electricity supplies is required, especially on large industrial or commercial sites.

ENC2/S

The Electricity Meter Node Controller (ENC2/S) allows the data measured by the EM-MPO/... to be accessed by IQ system devices over the IQ system current loop network. It is available in an IP30 enclosure (NBOX) with two input power supply versions (230 Vac or 24 Vac/dc).

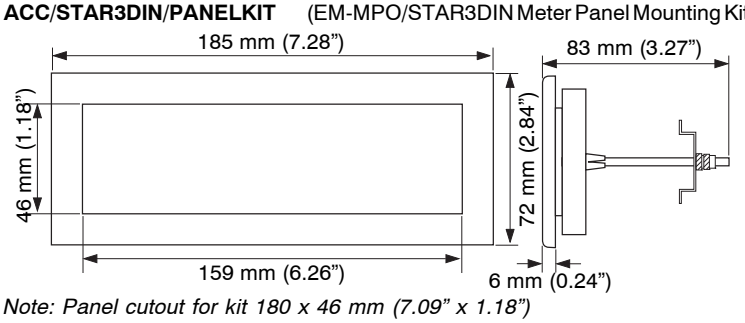
Features

- Multi-parameter metering
- Range of units available
- Fully configurable
- Class 1 accuracy (/STAR3DIN, /STAR3 only)
- Selectable backlit LCD display
- Programmable CT and VT ratios
- Split ring CTs available
- Through panel or DIN rail mounting versions
- Optional panel mounting kits for DIN mounting versions
- RS485 to network interface (ENC2/S)
- Polarity independent CT connections (except cogeneration)
- Suitable for use with VTs (except /SIRIO)

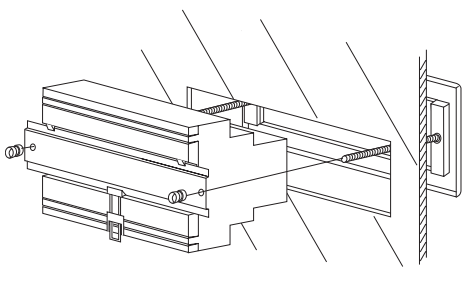
- Standard IQ Configuration modules
- Automatic network test
- 116 node addressable

Physical

ACC/STAR3DIN/PANELKIT (EM-MPO/STAR3DIN Meter Panel Mounting Kit)



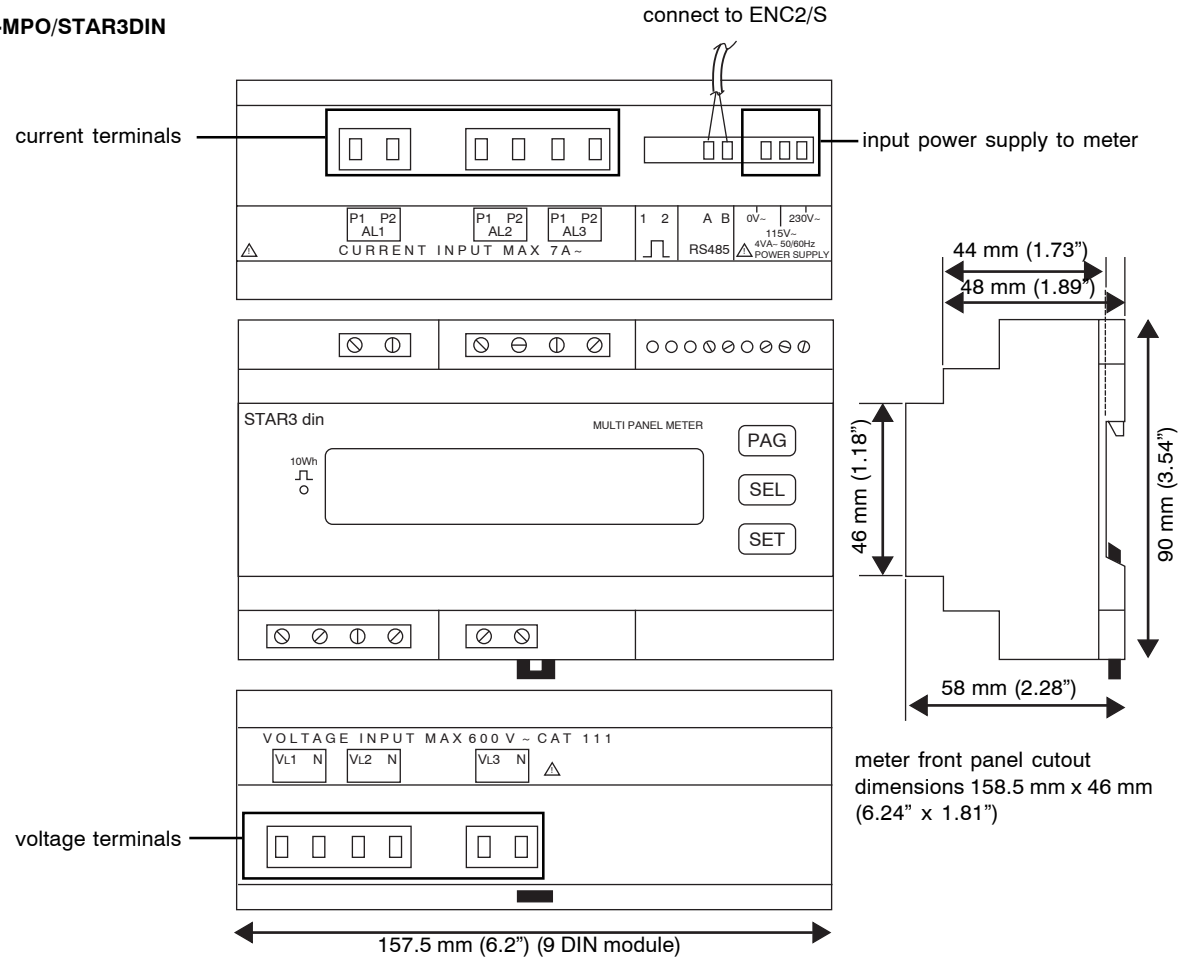
Note: Panel cutout for kit 180 x 46 mm (7.09" x 1.18")



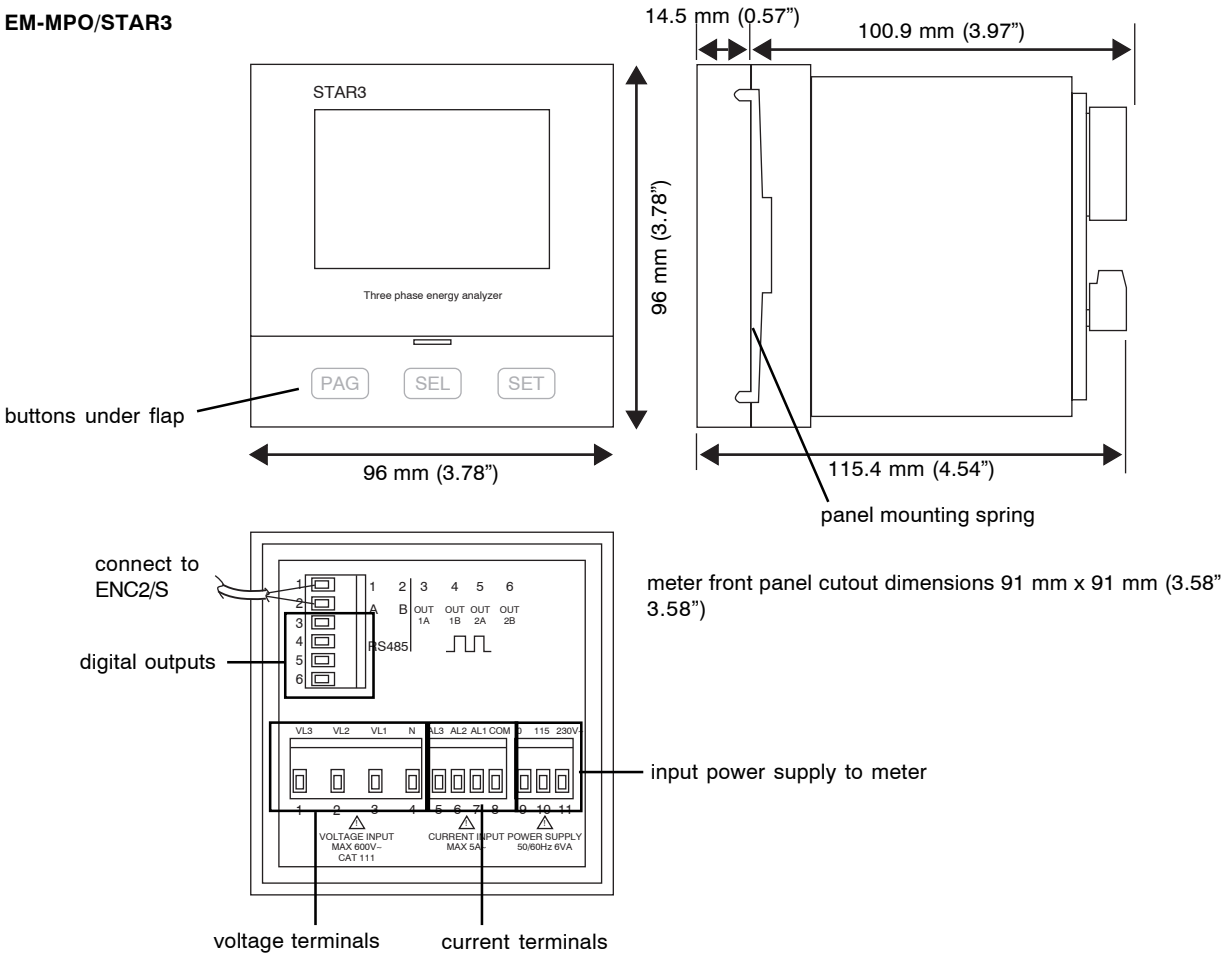
Detail of assembly to meter

Physical (continued)

EM-MPO/STAR3DIN

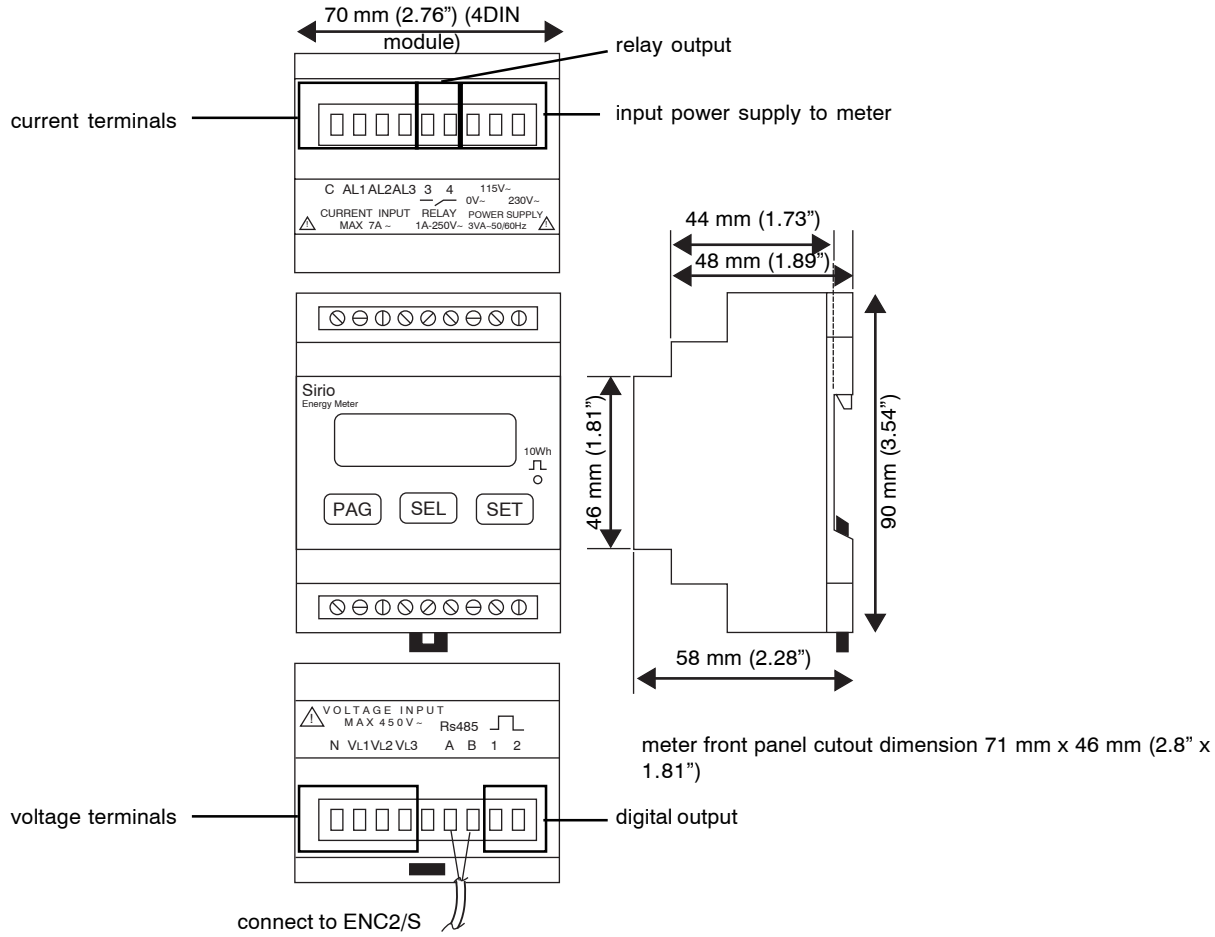


EM-MPO/STAR3



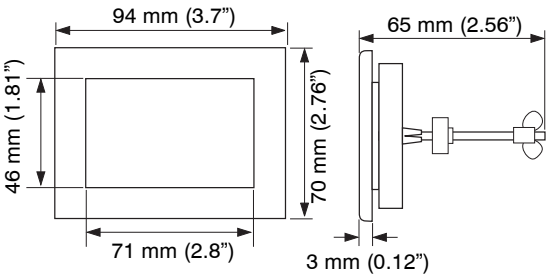
Physical (continued)

EM-MPO/SIRIO

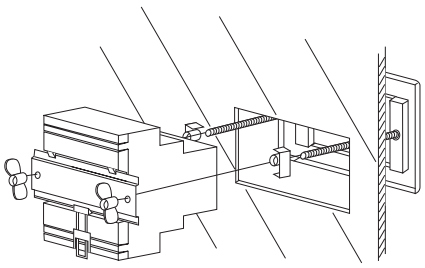


meter front panel cutout dimension 71 mm x 46 mm (2.8" x 1.81")

ACC/SIRIO/PANELKIT



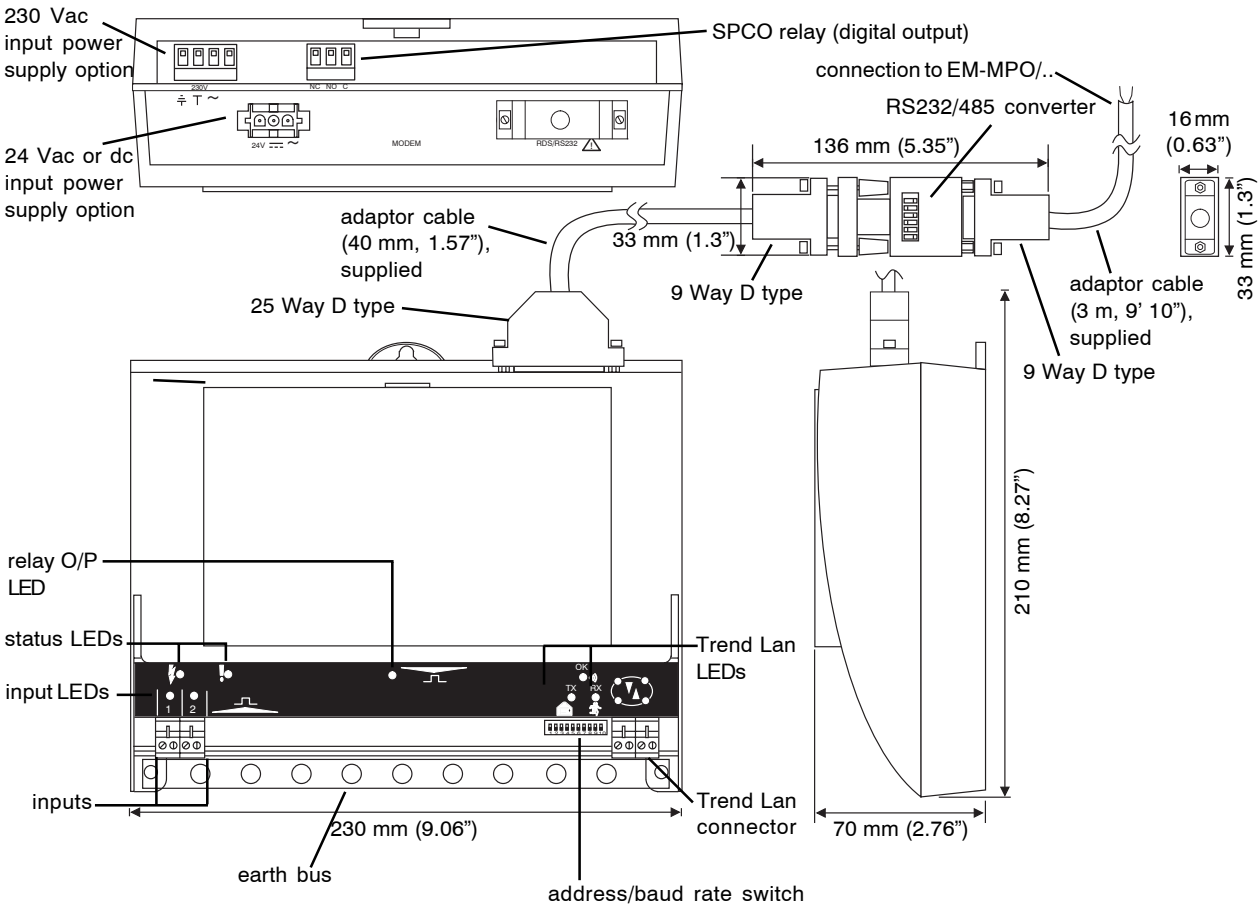
Note: Panel cutout for kit 88 mm x 49 mm (3.46" x 1.93")



Detail of assembly to meter

Physical (continued)

ENC2/S



FUNCTIONALITY

The EM-MPO/.. and the ENC2/S together provide electricity measurements which can be accessed by IQ system devices. The EM-MPO/.. takes the measurements and sends them to the ENC2/S in standard RS485 interface protocol. ENC2/S stores this data in memory and calculates further measurements. IQ system devices can then read the measurements from the ENC2/S using IQ system network communications.

EM-MPO/..

Front panels

All EM-MPO/.. units have an LED display on which to display the measured parameters, and to enable the unit to be configured. They also have three pushbuttons PAG, SEL, and SET.

PAG: This steps though the parameter types (e.g. V, A, W)
SEL: This selects parameters within the type (e.g. for current: A_l, $A_{neutral}$, $A_l$average)
SET: This is used to configure the unit.
PAG+SEL: This combination will enter configuration mode on the unit.

RS485 Output

The unit provides a standard RS485 output to transmit the measurements to the ENC2/S which can be up to 3 m away (set by default for ENC2/S communications)

Configuration

All EM-MPO/.. units have the following parameters configured by default with the correct settings for communication with the ENC2/S. If they have been changed then they should be returned to the following settings:

RS485 Baud Rate: 9600
RS485 Parity: None
RS485 Address (modbus): 1

ALL EM-MPO UNITS MUST HAVE THE RS485 PROTOCOL CONFIGURED FOR ASCII
Their protocols are configured by default for IEEE, and must be changed to ASCII

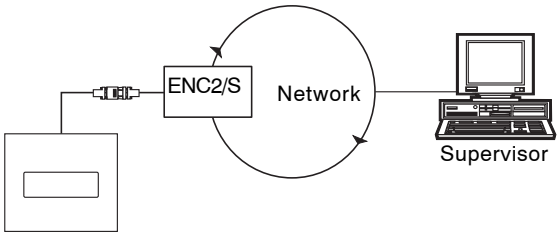
All meters need to be configured to cater for:

Voltage transformers (cannot be used on /SIRIO)
Current transformers
Connection type (e.g. 3 phase (delta), 3 phase +neutral (star), 2 phase with neutral, Single phase with neutral).

Configuration mode also enables the counters and the averages to be reset.

The table below indicates the major differences between the 3 meters.

	/STAR3DIN	/STAR3	/SIRIO
Parameters sent to ENC2/S	33	33	32 (not -ve 3 Phase Energy)
Parameters displayed on meter	33 transmitted plus 16	33 transmitted plus 10	7
Accuracy	<0.5%: V, I, Power	<0.5%: V, I, Power	1%: V, I 2%: Power
Fixing	DIN rail (panel kit available)	Front panel	DIN rail (panel kit available)
Max Volts	430 Vac phase to neutral 600 Vac phase to phase (Use VTs for greater volts)	430 Vac phase to neutral 600 Vac phase to phase (Use VTs for greater volts)	264 Vac phase to neutral 450 Vac phase to phase
VTs	yes	yes	no
Cogeneration	yes	yes	no
Display	Dot matrix LCD	multi-segment bright red on black LCD	8 digit LCD
Digital Outputs	none	2 electronic	1 electronic 1 mehanical
Consumption	4 VA	4 VA	3 VA



EM-MPO/STAR3DIN

The EM-MPO/STAR3DIN is a DIN rail mounted high quality energy analyser with a dot matrix LCD display. A mounting kit is available to facilitate front panel mounting (ACC/STAR3DIN/PANELKIT)

Input Power Supply

The EM-MPO/STAR3DIN requires 230 Vac (fused at 100 mAT) or 115 Vac (fused at 200 maT), 35 to 400 Hz, at 4VA.

Parameters

In addition to the parameters delivered to the ENC2/S, the unit can display:

Minimum Phase voltages V_{ln} (V)
Maximum Phase voltages V_{ln} (V)
Phase to Phase Voltages V_{lx}-V_{ly} (V)
Minimum Phase Currents (A)
Maximum Phase Currents (A)
Neutral Current (A) - Star only
Average Phase Currents (A)
Maximum Demand Phase Currents (A)
Total Maximum Demand Power (kW)
Total Maximum Demand Apparent Power (kVA)
Total Maximum Demand Reactive power (VAr)
Positive 3 Phase Apparent Energy Counter (kVAh)
Phase Voltage Total Harmonic Distortions (%)
Total Voltage Total Harmonic Distortion (%)
Phase Current Total Harmonic Distortions (%)
Total Current Total Harmonic distortion (%)

Connection

The unit can be connected in the following configurations:

Single Phase with neutral (1CT)
2 Phase with neutral (2CTs) Diphase
3 Phase (3CTs) Delta
3 Phase with Neutral (3CTs) Star
3 Phase using 2 VTs (3CTs) Delta
3 Phase using 2 CTs (2CTs) Delta

Voltage transformers can be used in all configurations, 1 VT for each phase (except for 3 phase delta using 2 VTs)

Configuration

The following settings must be configured:
RS485: Default baud rate and parity settings OK, see above.
Protocol must be changed from IEEE to ASCII
RS485 address (modbus): Default setting OK, see above
VTs: If used must be set up. If not used set ratio to 1 (default)
CTs: Must be set up.
Connection: set up to one of the following:

Delta: 3 phase without neutral
Star: 3 phase with neutral
Diphase: 2 phase with neutral
Single-phase: 1 phase with neutral

The set up pages may also be used to:

Set integration time for calculation of average current and power (0 to 99 minutes, default 15 minutes)
Reset energy counters
Reset averages and maximum demands
Enable/Disable cogeneration counters (note that to measure cogeneration properly the CTs must be connected in the same direction)

FUNCTIONALITY (continued)

EM-MPO/STAR3

The EM-MPO/STAR3 is a front panel mounted energy analyser with a multi-segment bright red on black LCD display. It has two digital outputs for measurement pulses, or alarm indication.

Input Power Supply
The EM-MPO/STAR3 requires 230 Vac or 115 Vac, 35 to 400 Hz, at 4VA.

Parameters
In addition to the parameters delivered to the ENC2/S, the unit can display:

- Phase to Phase Voltages V_{lx}-V_{ly} (V)
- Neutral Current (A) - Star only
- Average Phase Currents (A)
- Maximum Demand Phase Currents (A)
- Total Maximum Demand Power (kW)
- Total Maximum Demand Apparent Power (kVA)
- Phase Voltage Total Harmonic Distortions (%)
- Total Voltage Total Harmonic Distortion (%)
- Phase Current Total Harmonic Distortions (%)
- Total Current Total Harmonic distortion (%)

Connection
The unit can be connected in the following configurations:

- Single Phase with neutral (1CT)
- 2 Phase with neutral (2CTs) Diphase
- 3 Phase (3CTs) Delta
- 3 Phase with Neutral (3CTs) Star
- 3 Phase using 2 CTs (2CTs) Delta

CTs must be used. VTs can be used in all configurations., 1 VT for each phase.

Configuration
The following settings must be configured:
RS485: Default baud rate and parity settings OK, see above.
Protocol must be changed from IEEE to ASCII
RS485 address (modbus): Default setting OK, see above
VTs: If used must be set up. If not used set ratio to 1 (default)
CTs: Must be set up.
Connection: set up to one of the following:

- Delta: 3 phase without neutral
- Star: 3 phase with neutral
- Diphase: 2 phase with neutral
- Single-phase: 1 phase with neutral

The set up pages may also be used to:

- Set integration time for calculation of average current and power (0 to 99 minutes, default 15 minutes)
- Reset energy counters
- Reset averages and maximum demands
- Enable/Disable cogeneration counters (note that to measure cogeneration properly the CTs must be connected in the same direction)

Alarm Outputs: The two alarm outputs can be set to either:

- 100 ms pulse mode
- 20 ms pulse mode
- Relay mode

This setting applies to both outputs, they cannot be set individually.

Pulse Modes
The outputs can be set individually to be sourced from one of the following parameters:

- +ve 3 Phase Active Energy consumed (kWh)
- -ve 3 Phase Energy (kWh)
- +ve 3 Phase Reactive Energy (kVArh)
- -ve 3 Phase Reactive Energy (kVArh)
- 3 Phase Apparent Energy (kVAh)

Each output also requires the value ('weight') of each pulse to be defined (e.g. 0.01 kWh/pulse)

Relay Mode
Note that it is possible to configure relay 1 to be controlled from the RS485 bus, but this feature is not available when the ENC2/S is connected.

The outputs can be set individually to indicate an alarm condition from one of the following parameters: Total Voltage or Phase Voltage, V_{LN}, (V)

- Total Current or Phase Current, A_{LN}, (A)
- Total Power or Phase Power (W)
- Total Apparent Power or Phase Apparent Power (VA)
- Total Reactive Power or Phase Reactive power (VAr)
- Total Power Factor or Phase Power Factor (cos ø)
- Total THD voltage or Phase THD voltage (%)
- Total THD current of Phase THD current (%)

When used as an alarm indication each output should be configured with the following settings:

- High alarm threshold
- Low Alarm threshold
- Hysteresis:
  The alarm condition is registered only if the value rises above the threshold by the percentage set
- Delay: The alarm condition is registered only if the alarm persists for longer than the alarm delay (000 to 999 s)

FUNCTIONALITY (continued)

EM-MPO/SIRIO

The EM-MPO/SIRIO is a DIN rail mounting multiparameter meter with an 8 digit LCD display.

Input Power Supply
The EM-MPO/SIRIO requires 230 Vac or 115 Vac, 35 to 400 Hz, at 3 VA

Parameters
It displays the following parameters:
- Mean Line Voltage (V)
- Main Phase Current (I)
- Total Active Power (W)
- Total Power factor (Cos ø)
- Average Active Power (W)
- Maximum Demand Active Power (W)
- Active Energy Counter (Wh)

The display selection is slightly different to the previous two meters.
The PAG key steps though three display pages, Voltage/Current, Active Power/Power Factor, and Active Energy Counter. With the Active Power/Power Factor selected, pressing the SEL key steps through the other pages, Average Active Power, Max. Dem. Active Power, and back to Active Power/Power Factor. The EM-MPO/SIRIO cannot supply the -ve 3 Phase Energy (node 58) parameter to the ENC2/S.

Connections
It can be connected in the following configurations:
- Single Phase with Neutral (1CT)
- 2 Phase with Neutral (2CTs) Diphase
- 3 Phase (3CTs) Delta
- 3 Phase with Neutral (3CTs) Star
- 3 Phase using 2CTs (2CTs) Delta

It cannot use VTs.

Configuration
The following settings must be configured:
RS485: Default baud rate and parity settings OK, see above.
- Protocol must be changed from IEEE to ASCII

RS485 address (modbus): Default setting OK, see above
CTs: Must be set up.
Connection: set up to one of the following:
- Delta: 3 phase without neutral
- Star: 3 phase with neutral
- Diphase: 2 phase with neutral
- Single-phase: 1 phase with neutral

The set up pages may also be used to:
- Set integration time for calculation of average current and power (0 to 99 minutes, default 15 minutes)
- Reset energy counters
- Reset averages and maximum demands

Alarm Outputs: The EM-MPO/SIRIO has two alarm outputs, one mechanical (1 A, 250 V) and one electronic (120 mA, 100 Vac). The two alarm outputs can be set to either:
- 100 ms pulse mode
- 20 ms pulse mode
- Relay mode

This setting applies to both outputs, they cannot be set individually.

Pulse Modes
The outputs can be set individually to be sourced from one of the following parameters:
- 3 Phase Active Energy consumed (kWh)
- 3 Phase Apparent Energy (kVAh)

Each output also requires the value ('weight') of each pulse to be defined (1, 10, or 100/pulse)

Relay Mode
The outputs can be set individually to indicate an alarm condition from one of the following parameters:
- Total Current (A)
- Total Voltage (V)
- Total Power (W)
- Total Power Factor (cos ø)

The mechanical alarm output can be set to either produce a level output, or a pulse output (e.g. to trip an external contactor) under alarm conditions.

Each relay mode output should be configured with the following settings:
- High alarm threshold
- Low Alarm threshold
- Hysteresis: The alarm condition is registered only if the value rises above the threshold by the percentage set
- Delay: The alarm condition is registered only if the alarm persists for longer than the alarm delay (000 to 999 s)

FUNCTIONALITY (continued)

ENC2/S

The ENC2/S allows an EM-MPO/... to be connected to the IQ system network. It stores values received from the meter, making them available to other devices on the IQ system network. Some values are calculated within the ENC2/S using readings received from the meter.

The ENC2/S consists of a customised IQ22x controller with an RS232/RS485 converter module connected to the specially modified RS232 port, and a dedicated script program (TCL) which performs the necessary communications and calculations to produce the measurements in the IQ controller analogue array. It also has further modules configured so that some of the measurements are identified by label and additional measurements are calculated within the ENC2/S.

Hardware

Unit: The ENC2/S is supplied in a plastic enclosure with a transparent plastic flip-up terminal cover. It has a 3 point mounting to facilitate installation. It has an RS232/RS485 converter connected by cable to the RS232 connector at the rear of the unit.

Connectors: Two part connectors are used throughout to facilitate wiring. A busbar is provided for screen termination.

Power: 230 Vac 50/60 Hz (/230 option), 24 Vac or 24 Vdc (/24 option).

Fusing: The controller has no replaceable fuses; protection is provided by a self-resetting thermally protected transformer.

Indicators: LED indicators for receive and transmit network current flow (RX, TX) and network OK ( ), also for all I/O channels, power ( ), and watchdog ( ). See specification section for details.

Network: The 2 part network terminals facilitate connection of 2 wire cables.

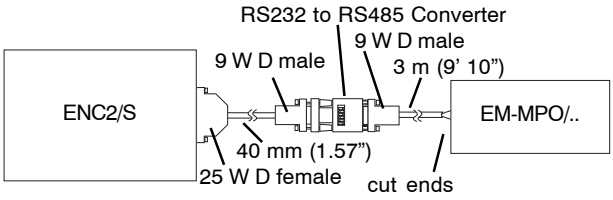
Address Switch : The ENC2/S device address on the local Lan is selected by address switch poles 1 to 7. The TCL program requires that the next address (i.e. address switch setting plus 1) is also allocated to the ENC2/S. Therefore the address switch may only be set in the range 4 to 8, 11 to 118 and both the setting and the setting plus 1 must be unique on the local Lan.

Baud Rate Switch : The local Lan baud rate is set by address switch poles 8 to 10 to 19k2, 9k6, or 1k2. The local Lan baud rate must be set to match other nodes on the local Lan.

Network bypass relay: In order that the network continues to operate if the ENC2/S fails, a node bypass relay is fitted to maintain network integrity in the event failure of the node's power supply, or failure of the node itself. The bypassing of a node will be recognised by the downstream node, and reported as a Lan Changed alarm.

Battery Backup: Details about the strategy configuration, time and date, and logged data are stored in RAM. A plug-in lithium cell provides power to maintain the data in the event of power failure, or the controller being switched off.

RS485 to EM-MPO/..: The RS232/RS485 converter module is connected to the rear of the unit by means of a 40 mm 25 way female D connector to 9 Way male D connector cable. The converter module is connected to the EM-MPO/.. by a 3 meter unscreened 9 way male D connector to open ends 2 wire cable. Both of these adapter cables are supplied with the unit.



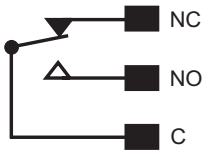
The interface module has DIP switches which are set by default to operate correctly with the ENC2/S EM-MPO/.. system. **They should not be changed.** They are set as follows:

Pole	Setting	Function
SW1	ON	2 wire
SW2	OFF	RXEN
SW3	OFF	TXEN
SW4	ON	ADE2
SW5	OFF	ADE1
SW6	OFF	ADE0

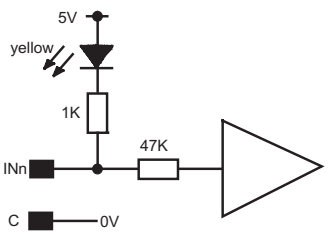
Note: The internal wiring to the rear RS232 plug is non-standard and is only intended for the ENC2/S application. If any other device were to be connected to this plug, damage may occur.

I/O channels: The ENC2/S is supplied with 2 digital input channels, and 1 digital (relay) output channel.

Digital (Relay) Output
(external channel unnumbered, configuration channel OP8)



Digital only inputs
(external connection inputs and configuration channels 1,2)



COMPATIBILITY

Supervisors: 916, 963, IQView, Viewpoint.
Utility software: PowerTool, Wupdn, SET.
Controllers: It can communicate to other IQ controllers using inter-controller communications.

Strategy files: A certain amount of configuration is present in the ENC2/S so if a strategy file is downloaded into the ENC2/S, the pre-configured data will be lost. The IQ Configuration Reference Manual Addendum covers the compatibility between different types of strategy files.

Sensor Logs: The IQ Configuration Reference Manual Addendum covers the compatibility between the ENC2/S sensor logs and supervisors and software tools.

Compatibility of EM-MPO/.. and ENC2/S with EM/MPO2 and EM/MPO+: The ENC2/S no longer sends current time to the meter (i.e. meter timer has to be set manually using front panel buttons). The following additional values are on longer received from the EM-MPO/.. meters:

Node	Label	Range	Units
42	Red Phase Current Crest Factor	0-10	
43	Yellow Phase Current Crest Factor	0-10	
44	Blue Phase Current Crest Factor	0-10	
59	-ve 3 Ph Reactive Energy	0-3200000	kVArh
60	Blue Phase Energy Cons	0-3200000	kWh

Note that using the current nomenclature: Red Phase ≡ L1, Yellow Phase ≡ L2, Blue Phase ≡ L3.

Compatibility of EM-MPO/... and EM/MPO2 with EM/MPO+: The EM/MPO+ has a fibre optic connection which is only compatible with ENC.
The EM/MPO2 is compatible with ENC2 and ENC2/S.
The EM/MPO is only compatible with ENC/S.
By comparison with the older meters the parameter values received from the EM/MPO meters have different units as follows: sensors 3, 11,12,13, are W instead of kW, and sensors 14 and 15 are now VA and VAr instead of kVA and kVAr. The ranges (i.e. maximum values that parameters can take) available in the EM-MPO/.. and EM/MPO2 are much larger than those on the EM/MPO+.

Compatibility with old RS232/485 converter: The old grey converter (K485-ADE) plugged directly into the back of the ENC2/S using its 25 Way D type). It can be plugged into the new ENC2/S but its old cable (9 Way D female to cut ends, 2 wire, EJ104355) must be used to connect to the EM-MPO/.., or EM-MPO2.

FIRMWARE

The firmware within the ENC2/S consists of two parts: the device part, and the TCL part. The device part (standard IQ2v3.1 firmware) consists of a number of standard IQ system configuration modules, and functions in exactly the same way as an IQ Controller. Some of these modules are already pre-configured as explained in the strategy section. The remaining modules may be configured in the normal way. The TCL part runs the TCL script which communicates with the EM-MPO/.., performs necessary calculation, and places the reading into the analogue array.

Configuration: The device part of the ENC2/S uses the standard IQ configuration mode which enables configuration across the network. Alternatively SET can be used but the existing special strategy should first be uploaded before adding to it using SET. The modified strategy can then be downloaded to the controller by SET. SET can also be used to upload, and download IQ2 files for backup purposes.

Communications: The ENC2/S is connected to IQ system devices by way of the IQ system current loop network, and to the EM-MPO/.. by way of an RS485 link.

Modules: The strategy within the device part consists of a number of individual functional blocks known as configuration modules. These blocks can be linked in various combination to perform manipulation of parameters from the EM-MPO/.. and to service the I/O. The table lists the different types of configuration modules and the number of each type available within the ENC2/S.

Module Type	Number	Module Type	Number
Sensor	32	Critical Alarm	4
Sensor type	8	Alarm History	20
Loop	16	IC Comms	16
Function	90	Digital Inputs	32
Logic	90	Fast Sequence	8
Driver	12	Zone	5
Knob	30	Schedule	8
Switch	20	Calendar	20
Sensor log	20	User Password	6
Sequence step	240	Sequence time	1 s
Analogue Nodes	255	Digital Nodes	505

Full details of the modules are given in the IQ Configuration Manual and Addendum. The ENC2/S contains the normal IQ2 features as described in IQ Configuration Manual Addendum: Engineers Journal (J), I/O Summary (i/o) Loader Issue (R(c), 'c' lower case), Serial Number (R(s), 's' lower case), Supply Frequency Option, Enhanced Logging, Module positions, and Strategy Cleardown.

Differences between the modules covered in the manuals and the ENC2/S's modules are described below:

Address module: The address module has a 'sUpervisor port addr' parameter which is ignored because the port is used for connection to the EM-MPO/...

TCL port: This is pre-configured in the ENC2/S to communicate with the EM-MPO/...

STRATEGY

The strategy is pre-configured, partially by the TCL script, and partially by module configuration.

Strategy Items (Inputs, Knobs, Switches)

Items		Label	Units	Default	Note
Inputs	I1	Ext Max Dem Sync Pls		0	Sync on contact closure if W1=1
	I9	Meter Comms Fail		0	0=no data received, 1=meter present
Switches	W1	Enable Ext Sync		0	Sync max demand either from I1 (W1=1) or internal timing pulse (W1=0)
	W2	Max Demand Reset		0	W2=1 resets 0.5 Hr maximum demand (kW, kVA, kVAr)
	W3	Totalisor Reset		0	W3=1 resets totalisors (MWh, MVAh, MVAr usage)
Knobs	K1	Int pulse time delay	Sec	0	Sets delay on internal pulse used for max demand sync if W1=0 (range 0 to 1799)

I9, Meter Comms Fail: The TCL part sets digital input 9 to indicate the meter communication state; (0 = No data received from meter in previous minute, 1 = meter present). I9 generates the alarm "Meter Comms Fail" when it changes to state 0. The fail condition is detected by the strategy (byte 32 bit 0) and it sets all readings from the meter to zero, and any derived values (i.e. sensors 21 to 29) are not incremented.
Note that care should be taken in interpreting calculated values after communication failure due to the way they are calculated.

I1, W1, K1, Demand Period Synchronisation: The demand period is set to a half hour by default. The start of the period is normally synchronised to an internal half hour pulse (W1=0), but there is an option to use an external contact closure connected to input 1 (I1) by setting W1 to 1. If the internal pulse is used, it can be delayed by K1 by up to 29 m, 59 s, to synchronise with the electricity meter. The start of the period zeroes the kWh, kVA, and kVArh consumed in the half hour.

W2, Max. Demand Reset: The half hour maximum demand values (kVA, kW, kVAr) are reset by setting W2 to 1.

W3,Totalisor Reset: The totalised values (MWh, MVAh, MVArh) are reset by setting W3 to 1

Sensors and Nodes

Sensor units and labels are set up as shown in the sensor table below.

Sensor	Label	Range	Units
1	Mean Phase ToPhase V	0-32000	V
2	Avg Phase Current	0-32000	A
3	Active Power	0-3200000	W
4	Power Factor Cos Phi	-1 to +1	
5	L1 Voltage	0-32000	V
6	L2 Voltage	0-32000	V
7	L3 Voltage	0-32000	V
8	L1 Current	0-32000	A
9	L2 Current	0-32000	A
10	L3 Current	0-32000	A
11	L1 Power	0-3200000	W
12	L2 Power	0-3200000	W
13	L3 Power	0-3200000	W
14	Apparent Power	0-3200000	VA
15	Reactive Power	0-3200000	VAr
16	Frequency	20-90	Hz
17	Active Energy Cons	0-3200000	MWh
18	Reactive Energy Cons	0-3200000	MVAr(h)
19	Apparent Power Peaks	0-3200000	kVA
20	Active Power Peaks	0-3200000	kW
21	kWh cons in Half Hr	0-3200000	kWh
22	kVArh cons in HalfHr	0-3200000	kVAr(h)
23	kVA HalfHrMax Demand	0-3200000	kVA
24	kW HalfHr Max Demand	0-3200000	kW
25	kVAh cons in Half Hr	0-3200000	kVAh
26	kVAr HalfHrMaxDemand	0-3200000	kVAr
27	MWh Usage	0-3200000	MWh
28	MVArh Usage	0-3200000	MVAr(h)
29	MVAh Usage	0-3200000	MVAh

Sensor Table

Note that the units can only be up to four characters long, thus as MVArh and kVArh are 5 characters long, the last character (h) is lost. This is indicated by (h) in the tables.
Note that if both V and A are at maximum range, then the maximum kW will be exceeded.
The TCL part receives the EM-MPO/.. values and places them into analogue nodes 1 to 16, and 33 to 58 (excluding 42 to 44 and 47 to 52). **Sensors 1 to 16** monitor nodes A1 to A16 directly. **Sensors 17 to 29** monitor values calculated by the strategy modules.

The values placed into nodes A33 to A60 by TCL are shown in the nodes table below.

Node	Label	Range	Units
33	L1 Power Factor Cos Phi	-1 to +1	
34	L2 Power Factor Cos Phi	-1 to +1	
35	L3 Power Factor Cos Phi	-1 to +1	
36	L1 Reactive Power	0-3200000	VAr
37	L2 Reactive Power	0-3200000	VAr
38	L3 Reactive Power	0-3200000	VAr
39	L1 Apparent Power	0-3200000	VA
40	L2 Apparent Power	0-3200000	VA
41	L3 Apparent Power	0-3200000	VA
x			
45	+ve 3 Phase Active Energy Cons.	0-3200000	kWh
46	+ve 3 Ph. Reactive Energy	0-3200000	kVAr(h)
x			
53	3 Phase Avg Reactive Power	0-3200000	VAr
54	3 Phase Avg Apparent Power	0-3200000	VA
55	3 Phase Avg Active power	0-3200000	W
56	3 Phase Apparent Power Peaks	0-3200000	VA
57	3 Phase Active Power Peaks	0-3200000	W
58	-ve 3 Phase Energy	0-3200000	kWh

Nodes Table

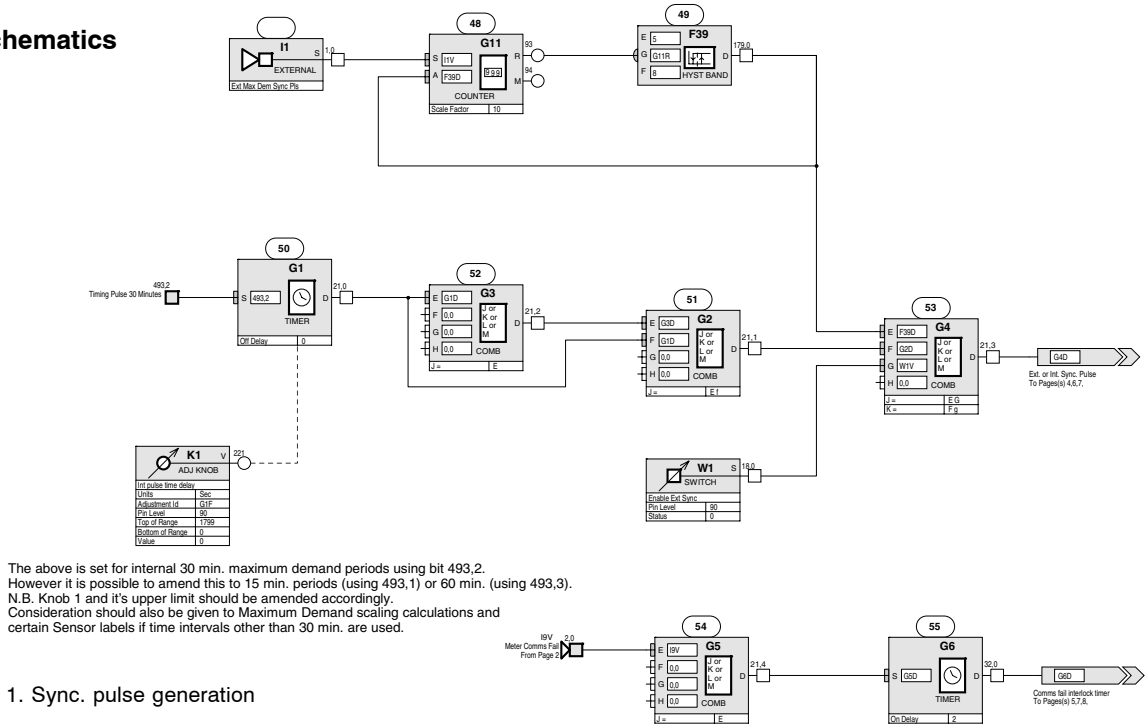
Note that L1, L2, L3 were previously referred to as red, yellow, blue phases respectively.
Note that Node 58 -ve 3 Phase Energy is not available from EM-MPO/SIRIO; the value will be set to zero.
Analogue nodes do not have labels or units so these would have to be set up in the supervisor.
Sensors **17, 18, 19, 20** are set to the values of nodes 45, 46 , 56, 57 respectively divided by 1000 (e.g. converting kWh into MWh, and VA into kVA).
Sensors **21, 22** measure active, and reactive energy consumed in a half hour by monitoring the changes in nodes 45 and 46 respectively. **Sensor 25** measures apparent energy consumed in a half hour by integrating sensor 14 and dividing by 1000. Sensors **21, 22, 25** are reset to zero at the beginning of each half hour period by the synchronisation pulse.
Sensors 23, 24, 26 measure apparent, active, and reactive, half hour maximum demand by keeping the maximum values of sensors 25, 21, and 22 respectively (multiplied by 2 to give full power units e.g kW). They are reset to zero by W2.
Sensors 27, 28, 29 keep totalised values of sensors 3, 15 and 14 (divided by 1 million) respectively; they are reset to zero by W3.
Nodes 45, 46, 56, 57 and 58 can be reset to zero by EM-MPO/.. configuration (see appropriate meter manual).
Node 58 will only give negative energy (i.e. power generation back into input power supply) if Cogeneration (COG) is set by EM-MPO/.. configuration (see appropriate meter manual).
The definitions of the measurements (e.g. power peaks) are given in the appropriate meter manual.

Plotting Channels

Sensors	Description	Plot Channels	Period	No of records
1 to 16	see table	1 to 16	1 min	1000
21	kWh cons in half hr	19	30 mins	1000
22	kVarh cons in half hr	17	30 mins	1000
25	kVAh cons in half hr	18	30 mins	1000
28	MVArh Usage	20	30 mins	1000

STRATEGY

Schematics



The above is set for internal 30 min. maximum demand periods using bit 493,2.
However it is possible to amend this to 15 min. periods (using 493,1) or 60 min. (using 493,3).
N.B. Knob 1 and it's upper limit should be amended accordingly.
Consideration should also be given to Maximum Demand scaling calculations and certain Sensor labels if time intervals other than 30 min. are used.

Fig 1. Sync. pulse generation

The maximum demand period is based on the 30 minute timing pulse bit 493,2. As indicated in fig 1, the period could be changed to a 15 m or 60 m period. Knob 1 (K1) sets a delay (0 to 1799 s, 29 m 59 s) on the standard timing pulse to specify the start of the maximum demand period. This is done by a combination of logic modules G1, G2, and G3. G1 produces the delay on the falling edge of the timing pulse as specified by K1. G2 and G3 together then produce a 1s pulse at the end of the delayed pulse. Logic module G4 then allows switch 1 (W1) to select either this pulse, or an external synchronisation pulse connected by way of digital input 1 (I1). G11 and F39 are used to ensure that the input to G4 remains set for one sequence cycle, so that G4 will gate it through if appropriate. The meter communication state is indicated by I9; if I9=1, meter communications are OK. This is filtered by G6 so that it must stay OK for 2 secs for it to set bit 32,0. This bit is used to add zero to the power values (W, VA, VAr) and zero increment to energy consumed values (Wh, VArh) while the meter communications are faulty.

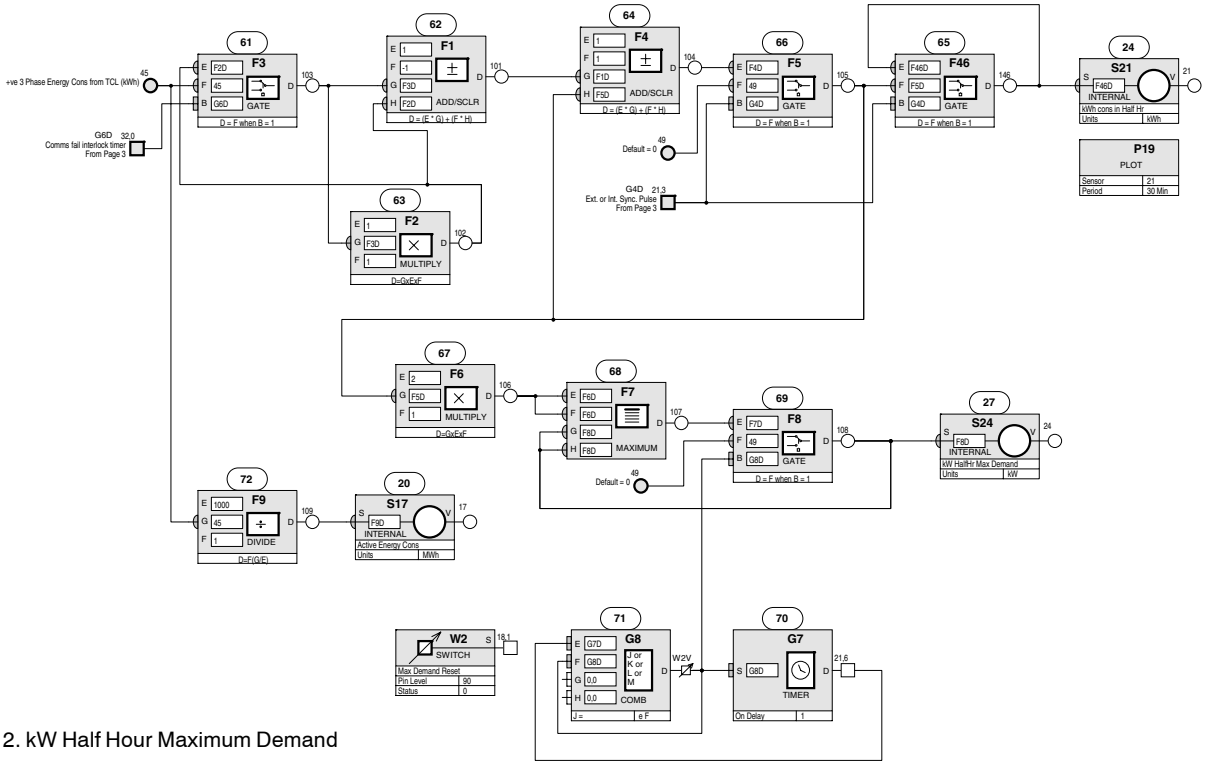


Fig 2. kW Half Hour Maximum Demand

In Fig 2., the meter input on node 45 (Positive 3 phase Active Energy Consumed - kWh) is divided by 1000 by F9 to give Active Energy Cons (MWh) which is monitored by S17. F2 is serviced after F3 and F1, so its output holds the previous value of node 45. F3 normally gates through the meter input on node 45, but gates through the previous value from F2 if there is a communications failure with the meter. F1 takes the previous value of node 45 from the current value so that the increase in value can be added into the accumulating total by function module F4. F46 is serviced before F5, so when the sync pulse occurs F46 passes the total through to S21, and F5 then passes through zero which clears the total for the start of the next period. The total, 'kWh cons in Half Hr' is monitored by S21; it will only show the total accumulated before the last sync pulse.
F6 multiplies the half hour consumption by two to give a true kW power value. F7 passes this value through if it is greater than the previous maximum held by the F7/F8 combination. This produces the 'kW HalfHr Max. Demand' which is monitored by S24. Switch 2 (W2), the Maximum Demand Reset, is inserted between modules G8 and G7 which ensure that the switch is set back to zero after one cycle of the sequence table. W2 causes F8 to gate through zero which resets the kW HalfHr Max. Demand.

Schematics (continued)

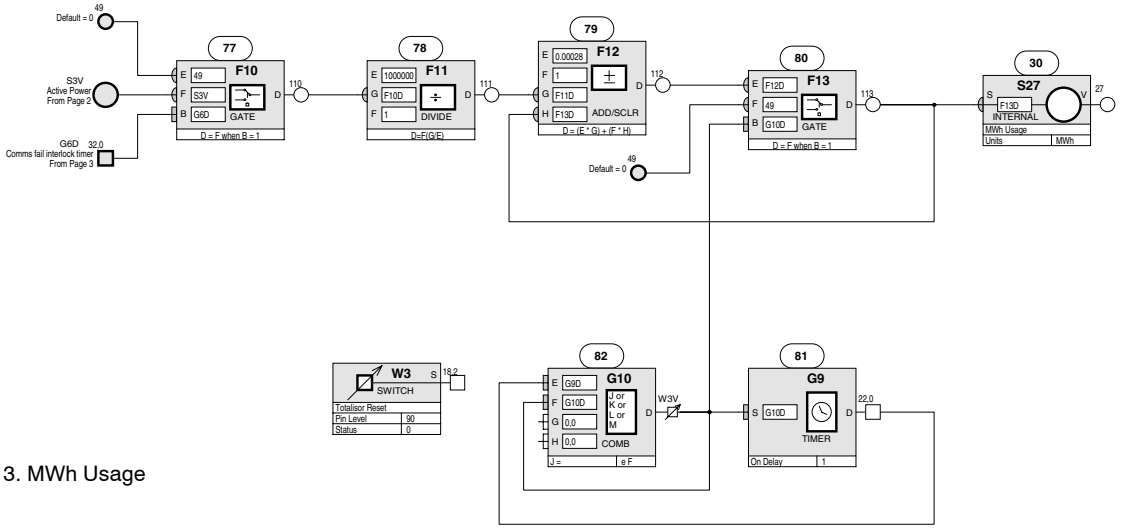


Fig 3. MWh Usage

In Fig. 3, F10 will normally gate through S3, Active Power (W), but if the meter communications fail, it will gate through zero. The active power is divided by 1,000,000 by F11, and then multiplied by 0.00028 (divided by 3600 - correct to 5 places after decimal point) within F12. The division by 3600 is to convert the MW value into MWh consumed per second, and then F12 and F13 together add this to the usage total every second to produce the totalised MWh Usage monitored by S27. Switch 3 (W3), the Totalisor Reset, is inserted between modules G10 and G9 which ensure that the switch is set back to zero after one cycle of the sequence table. W3 causes F13 to gate through zero which resets the MWh Usage.

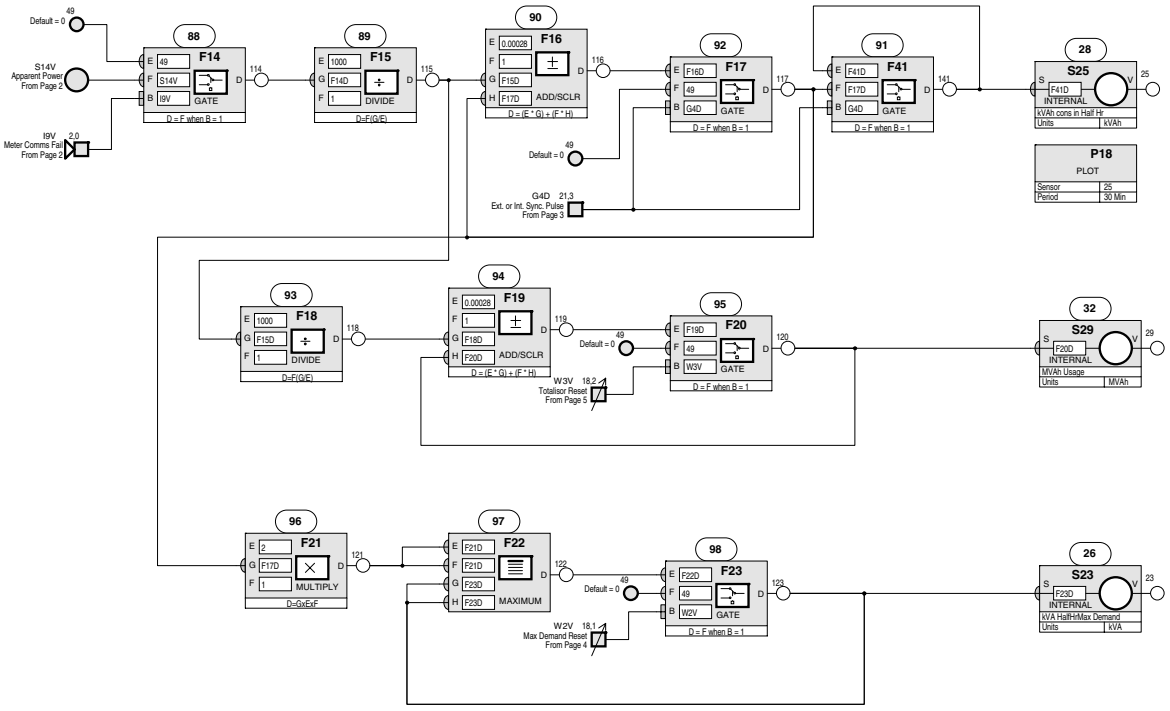


Fig 4. kVA Half Hour Maximum Demand

In Fig. 4, F14 will normally gate through S14, Apparent Power (VA), but if the meter communications fail, it will gate through zero. The active power is divided by 1000 by F15, and then multiplied by 0.00028 (divided by 3600 - correct to 5 places after decimal point) within F16. The division by 3600 is to convert the kVA value into kVAh consumed per second, and then F16 and F17 together add this in to the accumulating kVAh total every second. F41 is serviced before F17, so when the sync pulse occurs F41 passes the total through to S25, and F17 then passes through zero which clears the total for the start of the next period. The total, 'kVAh cons in Half Hr' is monitored by S25; it will only show the total accumulated before the last sync pulse.

The apparent power from F15 (kVA) is divided by 1000 by F18 and then multiplied by 0.00028 (divided by 3600 - correct to 5 places after decimal point) within F19. The division by 3600 is to convert the MVA value into MVAh consumed per second, and then F19 and F20 together add this in to the usage total every second to produce the totalised MVAh Usage monitored by S29. Switch 3 (W3), the Totalisor Reset, causes F20 to gate through zero which resets the MVAh Usage.

F21 multiplies the half hour consumption by two to give a true kVA power value. F22 passes this value through if it is greater than the previous maximum held by the F22/F23 combination. This produces the 'kVA HalfHrMax Demand' which is monitored by S23. Switch 2 (W2), Maximum Demand Reset, causes F23 to gate through zero which resets the kVA HalfHrMax Demand.

Schematics (continued)

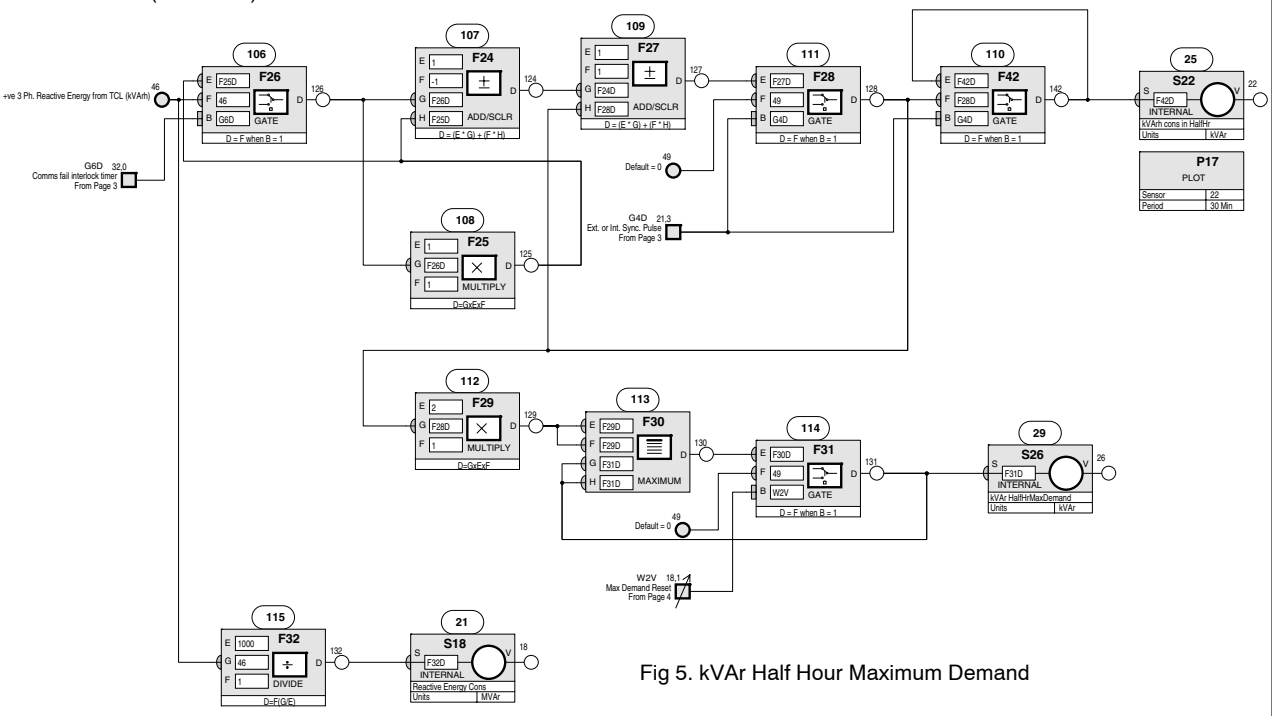


Fig 5. kVAr Half Hour Maximum Demand

In Fig 5., the meter input on node 46 (Positive 3 phase Reactive Energy Consumed - kVArh) is divided by 1000 by F32 to give Reactive Energy Cons (MVArh) which is monitored by S18. F25 is serviced after F26 and F24, so its output holds the previous value of node 46. F26 normally gates through the meter input on node 46, but gates through the previous value from F25 if there is a communications failure with the meter.F24 takes the previous value of node 46 from the current value so that the increase in value can be added into the accumulating total by function module F27. F42 is serviced before F28, so when the sync pulse occurs F42 passes the total through to S22, and F28 then passes through zero which clears the total for the start of the next period. The total, 'kVArh cons in HalfHr', is monitored by S22; it will only show the total accumulated before the last sync pulse.

F29 multiplies the half hour consumption by two to give a true kVAr power value. F30 passes this value through if it is greater than the previous maximum held by the F30/F31 combination. This produces the 'kVAr HalfHrMaxDemand' which is monitored by S26. Switch 2 (W2), Maximum Demand Reset, causes F31 to gate through zero which resets the kVAr HalfHrMaxDemand.

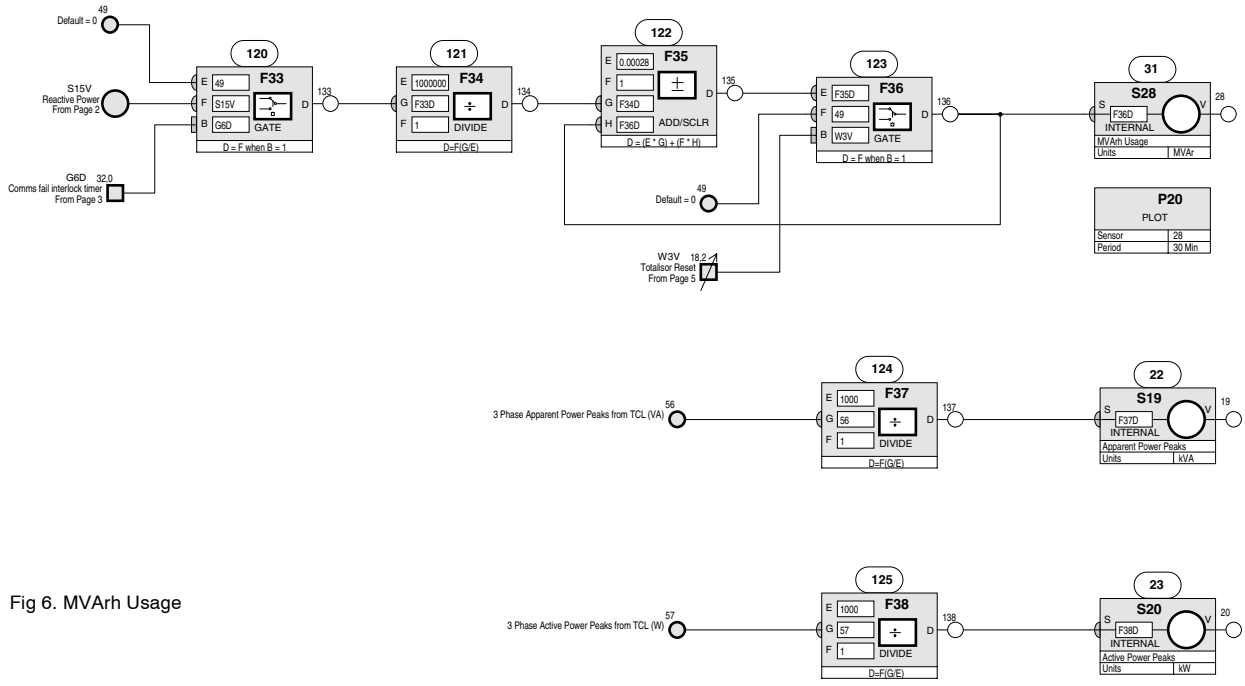


Fig 6. MVArh Usage

In Fig. 6, F33 will normally gate through S15, Reactive Power (VAr), but if the meter communications fail, it will gate through zero. The active power is divided by 1000,000 by F34, and then multiplied by 0.00028 (divided by 3600 - correct to 5 places after decimal point) within F35. The division by 3600 is to convert the MVAr value into MVArh consumed per second, and then F35 and F36 together add this to the usage total every second to produce the totalised MVArh Usage monitored by S28. Switch 3 (W3), the Totalisor Reset causes F36 to gate through zero which resets the MVArh Usage.

F37 takes the 3 Phase Apparent Power Peaks (VA) from node 56 and divides by 1000 to produce the Apparent Power Peaks (kVA) monitored by S19.

F38 takes the 3 Phase Active Power Peaks (W) from node 57 and divides by 1000 to produce the Active Power Peaks (kW) monitored by S20.

Strategy Version:

Attribute K in the Address module is set to the strategy version number.

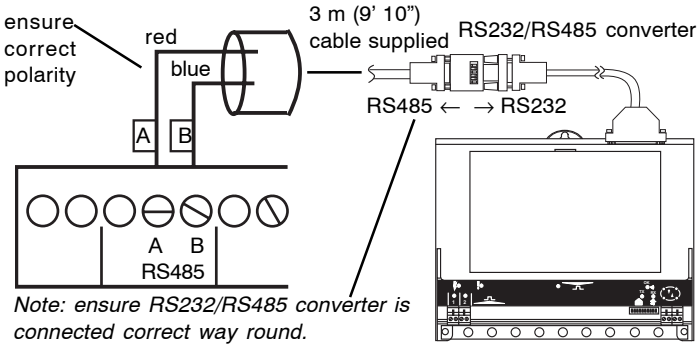
INSTALLATION

CONNECTIONS

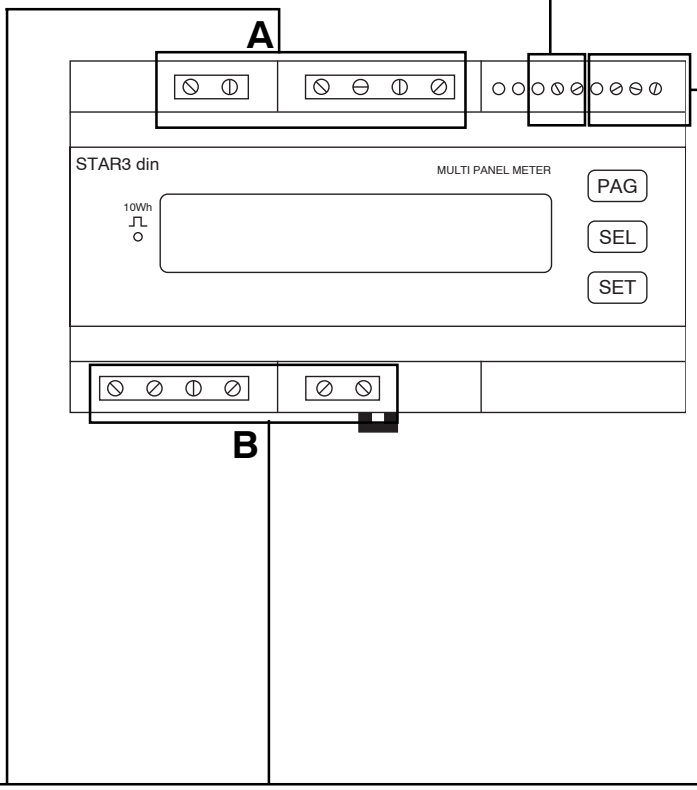
EM-MPO/STAR3DIN

Connection to ENC2/S

single part screw terminal, maximum cable cross section area of 2.5 mm² (14 AWG)



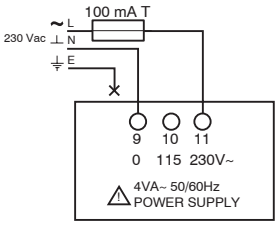
Note: ensure RS232/RS485 converter is connected correct way round.



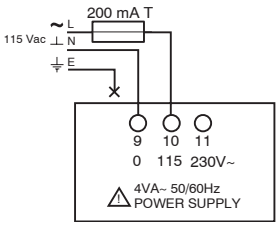
Meter Input Power Supply

Single part screw terminals.

230 Vac +15 % -20 %,
35 to 400 Hz, 4VA Supply



115 Vac +15 % -20 %,
35 to 400 Hz, 4VA Supply

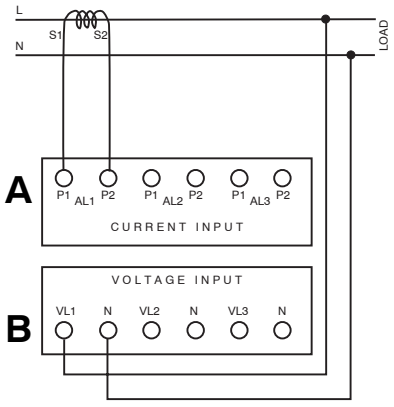


Note that this instrument does not require an earth (ground) connection

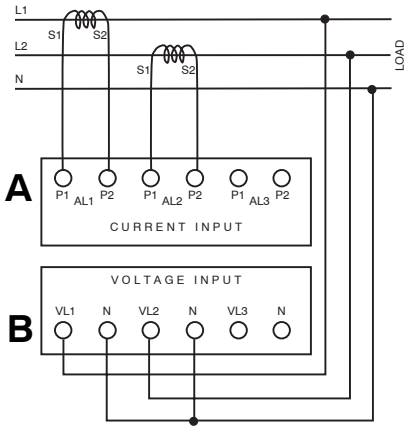
Measurement Connections

ABSOLUTE MAX VOLTAGE 600V, MAX CURRENT 7A

Single part screw terminals, cable cross section area of 4 mm² (12 AWG) maximum



Single Phase with Neutral



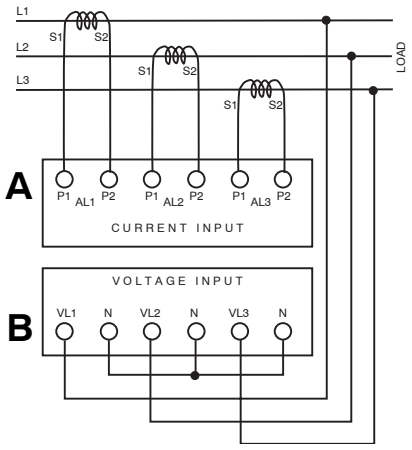
2 Phase with Neutral

INSTALLATION (continued)

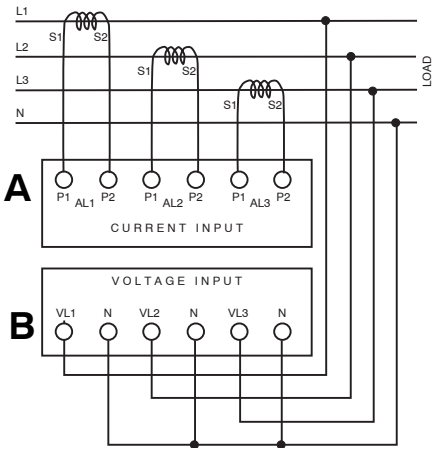
CONNECTIONS

EM-MPO/STAR3DIN

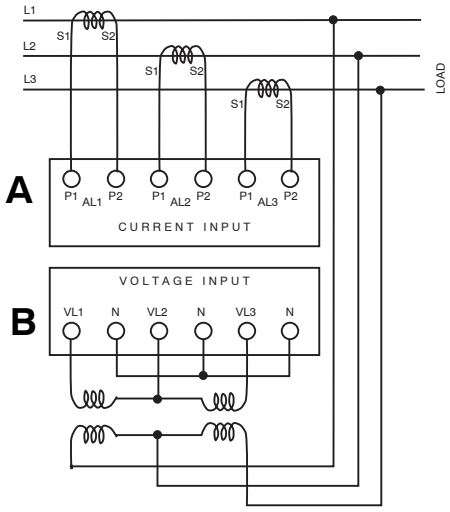
Measurement Connections (continued)



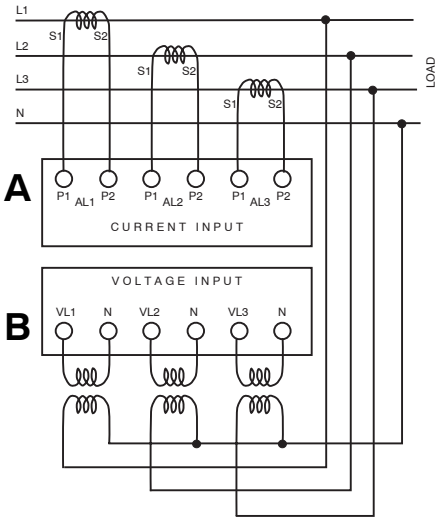
3 Phase without Neutral (Delta)



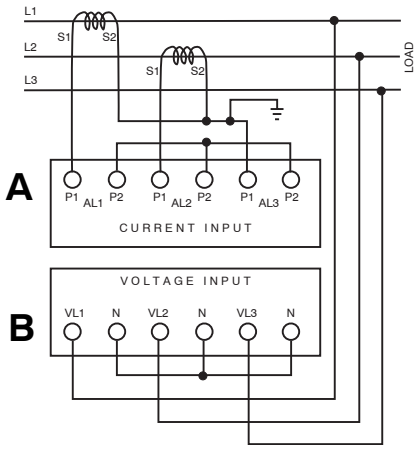
3 Phase with Neutral (Star)



3 Phase without Neutral (Delta) using 2VTs



3 Phase with Neutral (Star) using 3VTs



3 Phase without Neutral (Delta) using 2CTs

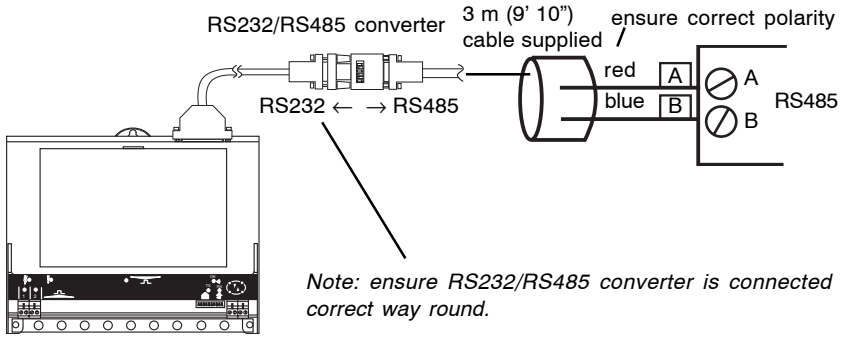
INSTALLATION (continued)

CONNECTIONS

EM-MPO/STAR3

Connection to ENC2/S

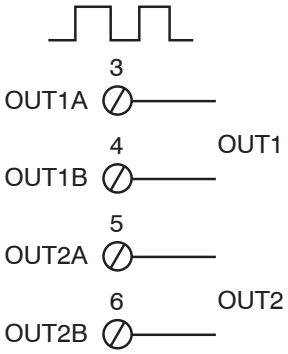
Two part screw terminal, maximum cable cross section area of 2.5 mm² (14 AWG)

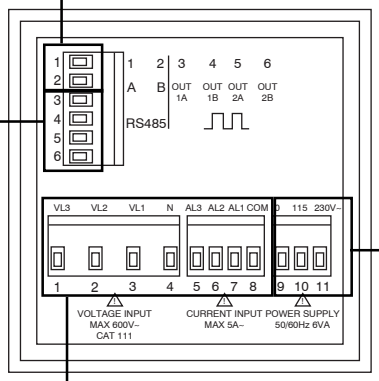


Note: ensure RS232/RS485 converter is connected correct way round.

Digital Outputs

Two part screw terminals maximum cable cross section 2.5 mm² (14 AWG).

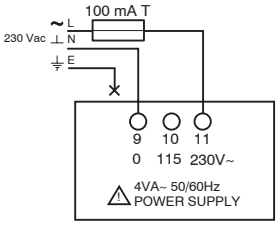



1 2 3 4 5 6
A B OUT 1A OUT 1B OUT 2A OUT 2B
RS485
VL3 VL2 VL1 N AL3 AL2 AL1 COM 115 230V~
1 2 3 4 5 6 7 8 9 10 11
VOLTAGE INPUT MAX 600V~ CAT III
CURRENT INPUT MAX 5A~
POWER SUPPLY 50/60Hz 6VA

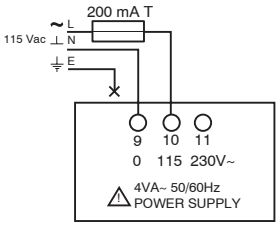
Meter Input Power Supply

Two part screw terminals maximum cable cross section 2.5 mm² (14 AWG).

230 Vac +15 % -20 %, 35 to 400 Hz, 4VA Supply



115 Vac +15 % -20 %, 50/60 Hz, 4VA Supply

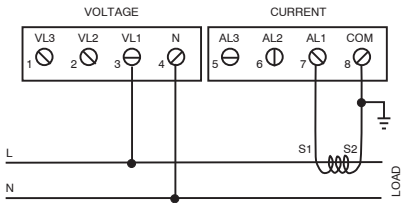


Note that this instrument does not require an earth (ground) connection

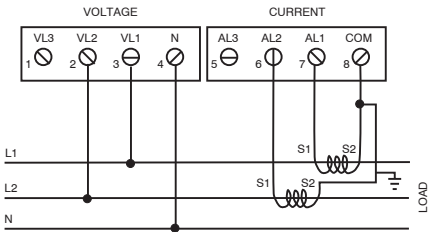
Measurement Connections

ABSOLUTE MAX VOLTAGE 600V, MAX CURRENT 5A

Two part screw terminals, maximum cable cross section 2.5 mm² (14 AWG)



Single Phase with Neutral



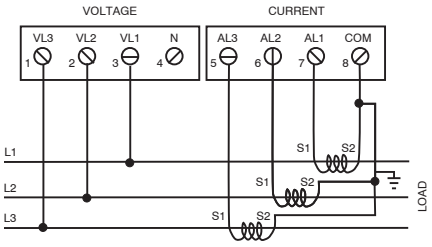
2 Phase with Neutral

INSTALLATION (continued)

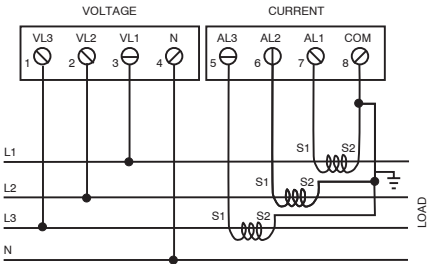
CONNECTIONS

EM-MPO/STAR3

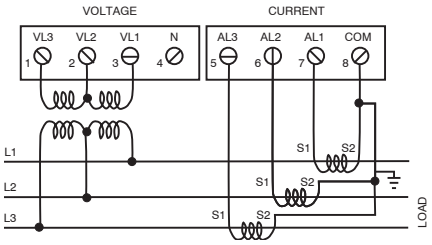
Measurement Connections (continued)



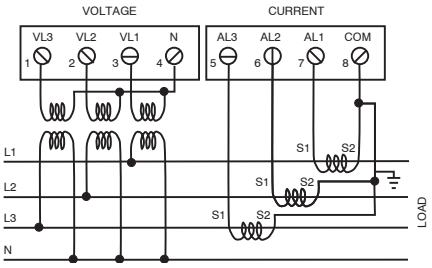
3 Phase without Neutral (Delta)



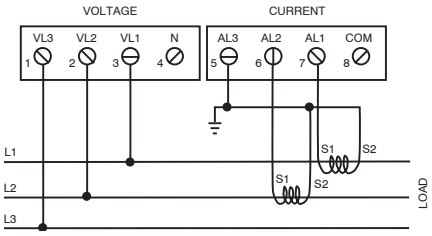
3 Phase with Neutral (Star)



3 Phase without Neutral (Delta) using 2VTs



3 Phase with Neutral (Star) using 3VTs



3 Phase without Neutral (Delta) using 2CTs

INSTALLATION (continued)

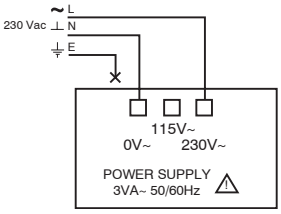
CONNECTIONS

EM-MPO/SIRIO

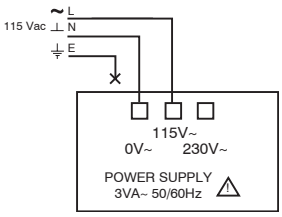
Meter Input Power Supply

Single part screw terminals maximum cable cross section 2.5 mm² (14 AWG).

230 Vac, 35 to 400 Hz, 3VA Supply



115 Vac +10 %, 35 to 400 Hz, 3VA Supply

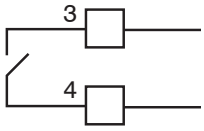


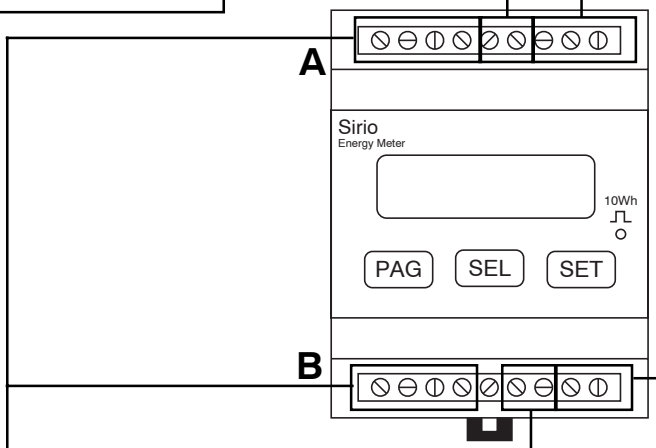
Note that this instrument does not require an earth (ground) connection

Relay Output

OUT2

250 V~ 1 A

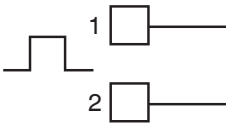




Electronic Digital Outputs

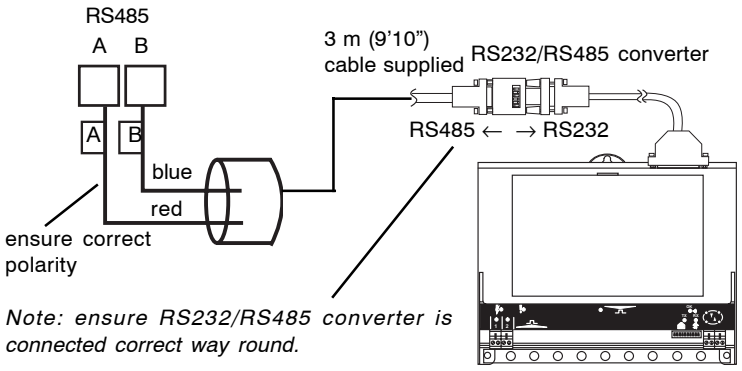
OUT1

120 mA, 100 Vac



Connection to ENC2/S

Single part screw terminal, maximum cable cross section area of 2.5 mm² (14 AWG)

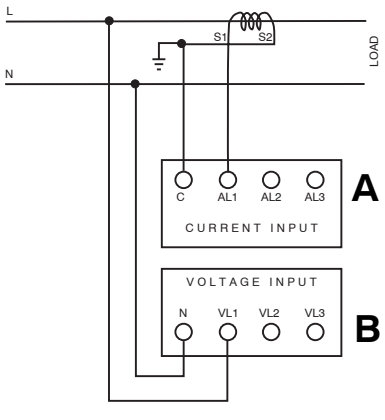


Note: ensure RS232/RS485 converter is connected correct way round.

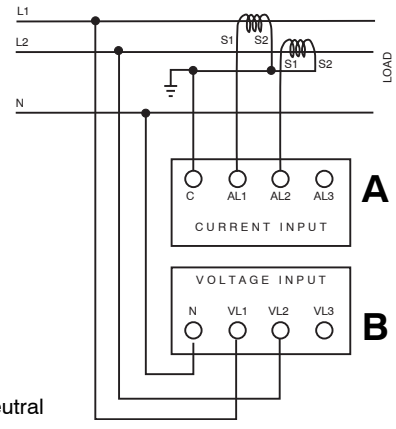
Measurement Connections

ABSOLUTE MAX VOLTAGE 450V~, MAX CURRENT 7A~

Single part screw terminals, maximum cable cross section 2.5 mm² (14 AWG)



Single Phase with Neutral



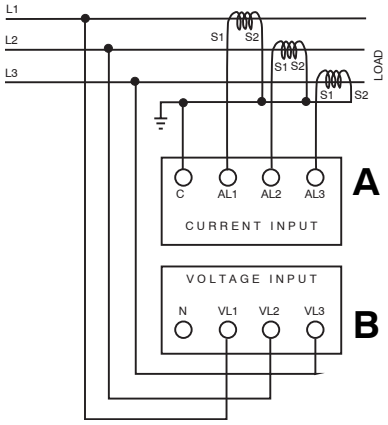
2 Phase with Neutral

INSTALLATION (continued)

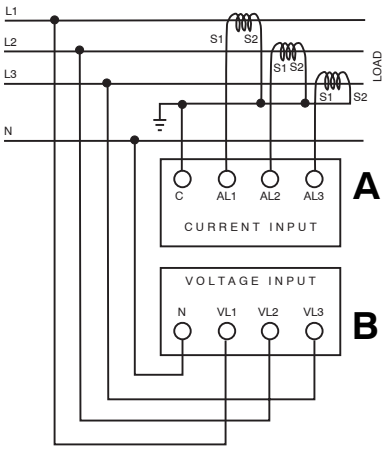
CONNECTIONS

EM-MPO/SIRIO

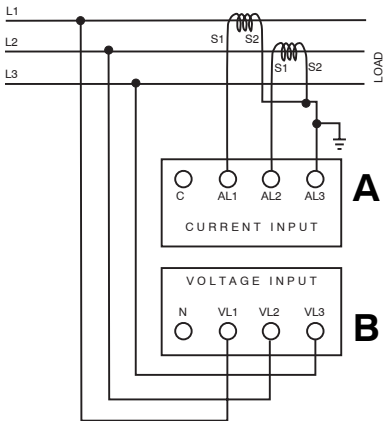
Measurement Connections (continued)



3 Phase without Neutral (Delta)



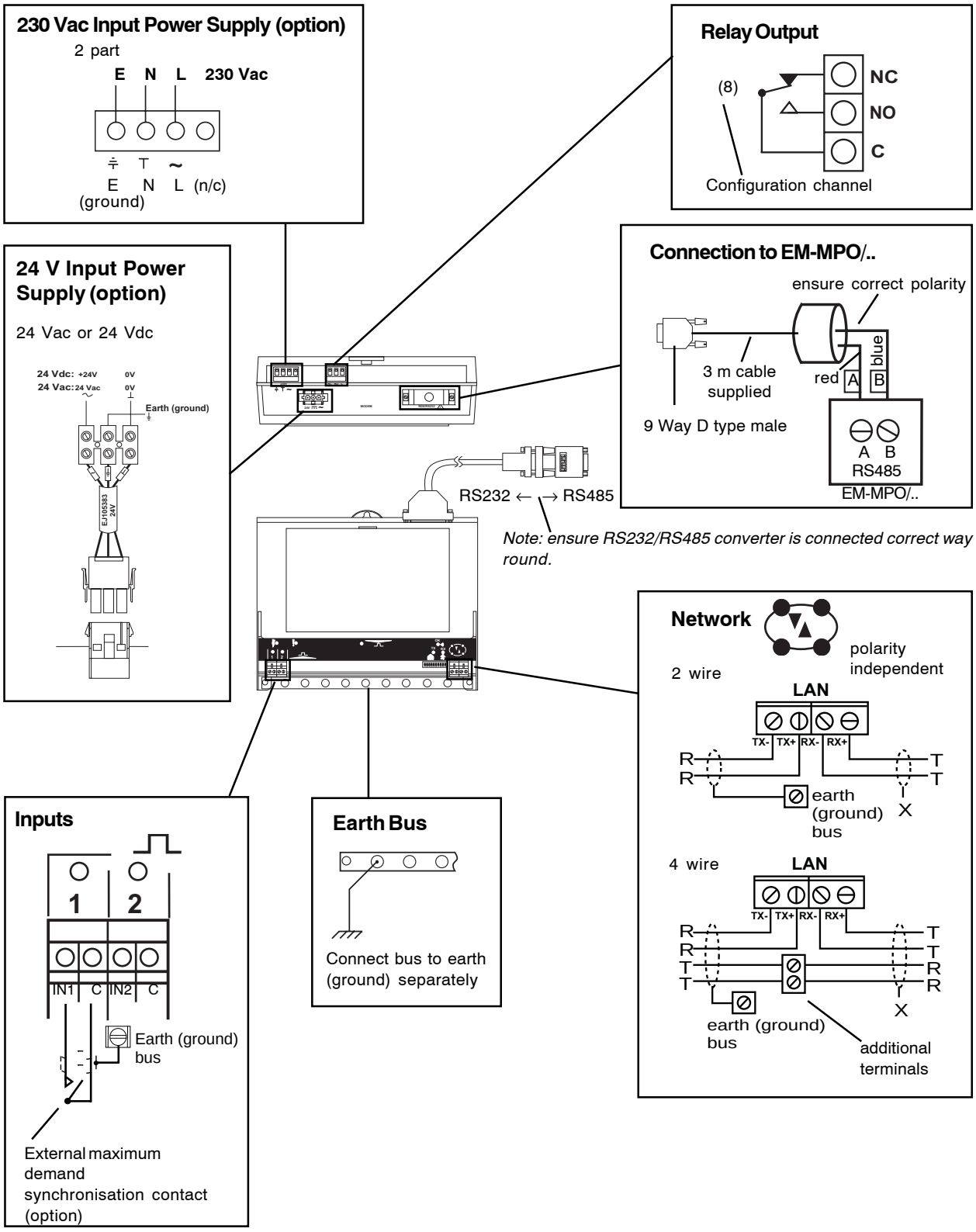
3 Phase with Neutral (Star)



3 Phase without Neutral (Delta) using 2CTs

INSTALLATION (continued)

ENC2/S



INSTALLATION (continued)

EM-MPO/..
Mount unit
Connect power
Connect current (or CTs)
Connect voltage (or VTs)
Connect to ENC2/S
Switch On
Configure meter

ENC2/S
Mount unit in position
Connect power (do not power up)
Terminate network, leave unconnected
Terminate I/O, leave unconnected
Specify network address and baud rate
Power up
Connect network and check
Configure strategy
Connect I/O and check
Backup configuration

Further installation details are given as follows:
EM-MPO/STAR3DIN Installation Instructions TG200770, EM-MPO/STAR3 Installation Instructions TG200771, EM-MPO/SIRIO Installation Instructions TG200772, NBOX/ENC2/S Installation Instructions TG200270.
The full configuration and use of EM-MPO/STAR3DIN is covered by EM-MPO/STAR3DIN User Manual TB200773, of EM-MPO/STAR3 is covered by the EM-MPO/STAR3 User Manual TB200774, and of EM-MPO/SIRIO is covered by the EM-MPO/SIRIO User Manual TB200775.
Installation of EM-MPO/STAR3DIN in a panel using the ACC/STAR3DIN/PANELKIT Panel Mounting Kit is covered by ACC/STAR3DIN/PANELKIT Installation Instructions TG200338.
Installation of EM-MPO/SIRIO in a panel using the ACC/SIRIO/PANELKIT Panel Mounting Kit is covered by ACC/SIRIO/PANELKIT Installation Instructions TG200775.

MAINTENANCE

Neither the EM-MPO/.. nor ENC2/S require any routine maintenance. From time to time the ENC2/S will require its backup battery to be changed. This should only be undertaken by a qualified IQ system Engineer as it involves a hot-replacement method. The meter interface script program (TCL) is lost if the battery is removed during power down. Contact your IQ system representative for advice.

DISPOSAL

COSHH (Control of Substances Hazardous to Health - UK Government Regulations 2002) ASSESSMENT FOR DISPOSAL OF NODE CONTROLLER. The only part affected is the lithium battery which must be disposed of in a controlled way.

RECYCLING.
All plastic and metal parts are recyclable. The printed circuit board may be sent to any PCB recovery contractor to recover some of the components for any metals such as gold and silver.

WEEE Directive :

At the end of their useful life the packaging, and product should be disposed of by a suitable recycling centre.
Do not dispose of with normal household waste.
Do not burn.

ORDER CODES

EM-MPO/STAR3DIN	DIN rail mounting high quality energy analyser including installation instructions and User Manual.
EM-MPO/STAR3	Front Panel Mounting energy analyser including installation instructions and User Manual.
EM-MPO/SIRIO	DIN rail mounting multiparameter energy meter including installation instructions and User Manual.
ACC/STAR3DIN/PANELKIT	Mounting kit to enable EM-MPO/STAR3DIN to be panel mounted including installation instructions.
ACC/SIRIO/PANELKIT	Mounting kit to enable EM-MPO/SIRIO to be panel mounted including installation instructions.
NBOX/ENC2/S/230	Communications node for EM-MPO/.. meter with 230 Vac input power supply.
NBOX/ENC2/S/24	Communications node for EM-MPO/.. meter with 24 Vac input power supply.

Current transformers

Current transformers (CTs) should be ordered separately. A range of split core CTs are available from your IQ System supplier as described in the Current Transformers data sheet TA102139.

Voltage transformers

For EM-MPO/STAR3DIN and /STAR3 measuring voltages in excess of their maximum input voltage requires voltage transformers (VTs) to be used. They should be ordered separately. *Please note that voltage transformers are not available from your IQ System supplier.*

SPECIFICATION

EM-MPO/STAR3DIN

Electrical

Input Power Supply Voltage :230Vac or 115 Vac, +15% -20%, 35 to 400 Hz
Meter Consumption :4VA
Meter voltage :430 Vac phase to neutral, 600 Vac phase to phase direct or greater using VTs (35 to 400 Hz).
Overload voltage :850 Vac phase to neutral maximum
Voltage Input Impedance :2 MΩ
Metered Current :External 5 A current transformer required
Current Input Consumption :1 VA
Measuring Range :0 to 120 % normal current (7 A)
Overload current :withstands 50 A for 1 s
Sensitivity :current 20 mA, voltage 10 V.
Sampling frequency :2.5 kHz
Measurements :True RMS up to 25th harmonic (1250 Hz with 50 Hz fundamental)
Measurement Accuracy :<0.5 % for V, I and Power
CT ratio selections :up to 59.9 kA:1A
VT ratio selections :up to 59.9 kV:1V
Backup :Maximum demand, energy meters, and setup are protected from power fail by Eeprom.
Connections :Single Phase, Diphase, 3 Phase Delta, 3 Phase Star.
Communications :To ENC2/S, RS485(ASCII), 9600 Baud, no parity.
Display :LCD dot matrix.

Environmental

Safety standards :IEC1010-1 430 V for Cat 111 and protection level 2 according to IEC 664-664A regarding the safety of the operators.
EMC :EN550011, EN61000-3-2, EN61000-3-3, EN61000-4-2, EN61000-4-3, EN6100-4-4 extension 4kV, EN61000-4-5, EN61000-4-6, EN6100-4-8, EN61000-4-11
Temperature :-10 °C to +50 °C (14 °F to 122 °F)
Humidity :20 % to 90 % RH non condensing
Protection :instrument IP20, front panel IP40

Mechanical

Dimensions :157.5 mm x 58 mm x 90 mm (6.2" x 2.28" x 3.54") (9 DIN modules)
Mounting :DIN rail 35 mm
Weight :0.6 kg (1.32 lbs)
Connectors
Measurement :V, I terminals single part screw terminals maximum cable cross section area 4 mm^2 (12 AWG).
RS485 :single part screw terminals maximum cable cross section area 2.5 mm^2 (14 AWG).

EM-MPO/STAR3

Electrical

Input Power Supply Voltage :230Vac or 115 Vac, +15% -20%, 35 to 400 Hz
Meter Consumption :4VA
Meter voltage :430 Vac phase to neutral, 600 Vac phase to phase direct or greater using VTs (35 to 400 Hz).
Overload voltage :850 Vac phase to neutral maximum
Voltage Input Impedance :2 MΩ
Metered Current :External 5 A current transformer required
Current Input Consumption :1 VA
Measuring Range :0 to 120 % normal current (5 A)
Overload current :withstands 50 A for 1 s
Sensitivity :current 20 mA, voltage 10 V.
Sampling frequency :2.5 kHz
Measurements :True RMS up to 25th harmonic (1250 Hz with 50 Hz fundamental)
Measurement Accuracy :<0.5 % for V, I and Power
CT ratio selections :up to 59.9 kA to 1A
VT ratio selections :up to 59.9 kV to 1V
Backup :Maximum demand, energy meters, and setup are protected from power fail by Eeprom.
Connections :Single Phase, Diphase, 3 Phase Delta, 3 Phase Star.
Communications :To ENC2, RS485(ASCII), 9600 Baud, no parity.
Display :reverse red LCD with LED backlight
Digital Outputs :two electronic relays, 120 mA, 250 Vac maximum

Environmental

Safety standards :IEC1010-1 430 V for Cat 111 and protection level 2 according to IEC 664-664A regarding the safety of the operators.
EMC :EN550011, EN61000-3-2, EN61000-3-3, EN61000-4-2, EN61000-4-3, EN6100-4-4 extension 4kV, EN61000-4-5, EN61000-4-6, EN6100-4-8, EN61000-4-11
Temperature :-10 °C to +50 °C (14 °F to 122 °F)
Humidity :20 % to 90 % RH non condensing
Protection :instrument IP20, front panel IP40

Mechanical

Dimensions :96 mm x 96 mm x 115.4 mm (3.78" x 3.78" x 4.54")
Mounting :front panel, cutout template 91 x 91 mm (3.58" x 3.58")
Weight :0.6 kg (1.32 lbs)
Connectors :two part screw terminals for maximum cable cross section area 2.5 mm^2 (14 AWG).

SPECIFICATION (continued)

EM-MPO/SIRIO

Electrical

Input Power Supply Voltage	:230Vac or 115 Vac, ±10 %, 35 to 400 Hz
Meter Consumption	:3VA
Meter voltage	:264 Vac phase to neutral, 450 Vac phase to phase (35 to 400 Hz).
Overload voltage	:600 Vac phase to neutral maximum
Voltage Input Impedance	:2 MΩ
Metered Current	:External 5 A current transformer required
Current Input Consumption	:1 VA
Overload current	:maximum 7 A permanent, 15 A for 1 second
Measurements	:True RMS up to 25th harmonic (1250 Hz with 50 Hz fundamental)
Accuracy	:1 % for voltage and current, 2 % for power Class 2 IEC1036
CT ratio selections	:up to 59.9 kA/1A
VT ratio selections	:no provisions for VTs
Backup	:Maximum demand, energy meters, and setup are protected from power fail by Eeprom.
Connections	:Single Phase, Diphase, 3 Phase Delta, 3 Phase Star.
Communications	:To ENC2, RS485(ASCII), 9600 Baud, no parity.
Display	:8 digit LCD display (128 segment)
Digital Outputs	:one electronic relays, 1 mechanical relay
OUT1	:electronic relay 120 mA, 100 Vac maximum
OUT2	:mechanical relay 1 A, 250 Vac maximum

Environmental

Safety standards	:IEC1010-1-400 V for Cat 111 and protection level 2 according to IEC 664-664A .
EMC	:EN550081-1 ed EN55022
Conforms to	Directive 89/336/EEC (EMC), Directive 72/23/EEC-93/68/EEC (LVD)
Temperature	:-10 °C to +60 °C (14 °F to 140 °F)
Humidity	:20 % to 80 % RH non condensing
Protection	:instrument IP20, front panel IP40

Mechanical

Dimensions	:70 mm x 58 mm x 90 mm (2.76" x 2.28" x 3.54") (4 DIN modules)
Mounting	:DIN rail 35 mm
Weight	:0.3 kg (0.66 lbs)
Connectors	:single part screw terminals for maximum cable cross section area 2.5 mm² (14 AWG).

SPECIFICATION (continued)

ENC2/S

Electrical

CPU :68334 32 bit micro-controller.
CPU Speed :16.78 MHz.
Cycle time :1 s.
Memory :128 kbyte battery backed SRAM, and 256 kbyte Flash.
Input Power Supply voltage
/230 :230 Vac +15%, -10%, 50 to 60 Hz.
/24 :24 Vac ±10%, 50 or 60 Hz or 24 Vdc (24 V to 36 Vdc)
Consumption :13 VA max.
Fusing :No replaceable fuses required. All protection self-resetting.
Battery backup :Battery maintains time, and logged data with input power supply off for at least 5 years.
Battery :Saft LM2450, 3 V, or equivalent.
Clock accuracy :30 s per month (typical).
Network transmission :20 mA serial 2 wire current loop, opto-isolated, polarity independent receiver, balanced transmitter.
Network distance :Dependent on cable type, see table below:

Cables	1k2 baud	9k6 baud	19k2 baud	No. of wires
Belden 9182	1000 m 1090 yds	1000 m 1090 yds	700 m 765 yds	2
Belden 9207	1000 m 1090 yds	1000 m 1090 yds	500 m 545 yds	2
Trend TP/1/1/22/HF/200 (Belden 8711)	1000 m 1090 yds	700 m 765 yds	350 m 380 yds	2
Trend TP/2/2/22/HF/200 (Belden 8723)	1000 m 1090 yds	500 m 545 yds	250 m 270 yds	4

Network baud rate :Selectable by links 1k2, 4k8, 9k6, 19k2 baud - set to be same as other nodes on local Lan.
Network address :Selectable by board switches 116 nodes addressable (4 to 118, excluding 9, 10). Uses selected address and selected address plus 1; both addresses must be unique on local Lan
Inputs :Input channels 1 & 2, digital inputs. Volt free contact. Count rate 30 Hz. Wetting current = 3 mA nominal. 5 V supply. Status LED per channel (ON = closed contact).
Relay Output :External connection 16 Configuration channel OP8. 1 pole changeover relay. Output rated for 240 Vac single phase only 8 A (resistive load), 5A (inductive, cos∅ = 0.4), 30 Vdc at 5 A (resistive load), and 20 Vdc at 5 A (inductive load). For 24 Vdc (inductive load) reduce to 2 A. Arc suppression recommended, see Relay Output Arc Suppression Installation Instructions, TG200208). Status LED per channel (ON = relay energised).

Indicators
Inputs :(yellow) Indicates status (ON= contact closed)
Relay output :(yellow) ON if relay energised
(power) :(green) ON when input power supply is connected
(watchdog) :(red) ON if controller has a software fault
OK (network) :(green) ON if network is operating. Flashes if prohibited controller network address set (0, 2, 3, >119).
RX :(yellow) ON if current is entering the network receiver
TX :(yellow) ON if current is flowing from network transmitter
Note that the (watchdog) LED flashes momentarily on power up

Mechanical

Dimensions :230 mm x 70 mm x 210 mm (9.06" x 2.76" x 8.27") (plus RS232/RS485 converter and cables)
Material
Box :ABS
Terminal cover :Clear Styrolux
Protection :IP30
Weight :1.4 kg (3.08 lbs)
Connectors
/230 :2 part connector for 0.5 to 2.5 mm² (14 to 20 AWG) cross section area cable.
/24 :Mat-N-Loc 2 part connector with 3 screw terminals for 0.5 to 2.5 mm² (14 to 20 AWG) cross section area cable.
Network :2 part connector with 4 screw terminals for 0.5 to 2.5 mm² (14 to 20 AWG) cross section area cable.
I/O :2 part connector with 2 screw terminals for 0.5 to 2.5 mm² (14 to 20 AWG) cross section area cable.
EM-MPO/.. :RS232/RS485 converter connected to ENC2/S by 25 Way D type female to 9 Way D type male 40 mm (1.57") cable (supplied). RS232/RS485 converter connected to EM-MPO/.. by 9 Way D type male to stripped ends 2 core 3 m (9' 10") cable (supplied). The stripped ends are to be screwed into the terminals.

Environmental

EMC
Emissions :EN50081-1.
Immunity :EN50082-2.
Safety :EN61010.
Ambient limits
storage :-10 °C to 50 °C (14 °F to 122 °F)
operating :0 °C to 45 °C (32 °F to 113 °F)
humidity :0 to 90 %RH non-condensing
Flammability
Casing material :Flame retardance, UL99V0
Glow wire test, UL746A(3)
Version
ENC2/S :TCL: v1.52, Strategy: ENC2v1.52f3
:firmware (IQ22x) v3.1
:RS232/RS485 converter K2-ADE

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